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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This study was done at the request of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics). It is a comprehensive analysis of the manpower requirements, mission capabilities, operational issues, and costs involved in civilian manning on the AE-26 (ammunition), AFS-1 (combat stores), and AD-37 (destroyer tender) type ships. Three major efforts have been incorporated into the analysis: the independent development of Notional Equal Capability Crews (NECC) to evaluate the civilian crews

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20. ABSTRACT (cont'd)

proposed by the Military Sealift Command (MSC), the analysis of a civilian manned AD Repair Department, and the development of a Notional Modified Crewing Concept for commercial contract manning which follows more closely the Navy's stated requirements.

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FINAL REPORT
CIVILIAN MANNING OF
AE, AFS, AND AD TYPE SUPPORT SHIPS
VOLUME I

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EXECUTIVE SUMMARY

This report documents a study of the AE-26 (ammunition), AFS-1 (combat stores), and AD-37 (destroyer tender) class auxiliary ships when manned with Navy Military, Navy civil service, and commercial contract mariners. The study was a comprehensive analysis of the manpower requirements, mission capabilities, operational impacts, and costs of the three manning options. The cost analysis is consistent with the rules used in the development of the Navy's POM-84.

The manpower analysis included the review of the Navy's Ship Manpower Document (SMD) and Manpower Authorization (MPA) for each ship[1/]. The crewing options developed are shown in Table 1.

The capability analysis indicated that the proposed MSC crew can man a four simultaneous underway replenishment station capability, but cannot meet a six station capability required by the POE for civilian manned TAE-26 and TAFS-8[2/] class auxiliaries. It was observed that four stations are probably sufficient for routine shuttle type operations, but not for task force operations which the AE may be called upon to perform in some circumstances. The POE analysis is in subsection III.A.2.

The capability analysis also indicated that Navy military crews on UNREP ships have additional personnel aboard who could substitute for specially trained personnel in some less specialized UNREP crew positions during round-the-clock contingency type operations. This

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1/ OPNAVINST 5320.228A; 6 June 1980; OPNAVINST 5320.121A; 6 January 1981; OPNAVINST 5320.434 (DRAFT); Manpower Authorization (OPNAV 1000); AE-26 dtd 02/04/82; AFS-1 dtd 02/05/82; AD-37 dtd 02/08/82.

2/ No TAFS-1 class ships are presently civilian manned. It was assumed that this class would be required to meet the same capability as the TAFS-8 class. The TAFS-8 class POE requires six simultaneous stations.

provides the Navy military crew with additional capability in extended operations when crew fatigue is a factor. The endurance analysis is in subsection III.A.3.

The tender capability analysis showed that there is a feasibility question in converting of the AD-37 to civilian manning, when the operating crew is housed aboard ship and the military repair crew spaces remain intact for contingency movement purposes. The tender capability analysis also showed that ship modification for the operating crew's civilian quarters would require the removal of the flag quarters on the 02 level. The employment of a civilian repair crew would require offship housing, as it was impossible to meet MSC Civilian Habitability Requirements for the Repair Department without reducing the repair shop space. In addition, CNO policy requires similar accommodations for civilian and military personnel aboard the same ship.

Since a civilian repair crew cannot be housed aboard the tender, an evaluation of possible housing at deployment ports was made. The analysis showed that there is no available housing for a civilian repair crew in Diego Garcia, substandard military housing in Rota and Subic Bay, and commercial housing in Naples and Yokosuka.

The manpower cost results indicate that the Navy civil service option was the least costly for both UNREP ships on an equal capability basis. This reflects a smaller civilian crew compared to the Navy military crew, as well as a lower cost per man compared to the commercial contract crew under the current work rules. The cost of vacations and pensions is the major driver in the commercial contract costs. The total base pay of the two civilian options are within a few percent of each other for equal capability crews. The UNREP ship manpower cost analysis is found in subsection V.A.

A breakdown cost analysis (detailed in subsection V.A.4.b) showed that commercial contract manpower cost on the UNREP ships:

- was greater than Navy civil service manpower cost even when the vacation allowance was cut to zero.

- equaled Navy civil service manpower cost when base pay was reduced approximately 35% on the TAE and 25% on the TAFS, assuming all commercial contract personnel accrue vacation at 21% base pay, and that certain other costs are deleted. Reducing base pay reduces other costs which are related to base pay.

- equaled Navy civil service manpower cost when the commercial contract crew size was reduced. These crew reductions were approximately 30% of the total crew on the TAE and 25% on the TAFS. This would reduce the number of UNREP crews by one half if all crewmen were taken from the replenishment personnel.

The total economic operating cost indicates that both UNREP ships are operated most economically when Navy civil service manned on an equal capability basis. However, the results indicate no more than a 2% annual cost savings when the TAE is Navy civil service manned. The FYDP cost shows that the AFS costs less when operated by Navy civil service mariners, but the AE costs less when operated by Navy military personnel. The result for the AE reflects the cost for civilian habitability modification charged in the FYDP period, while the economic cost prorates this over the remaining life of the ship. Detailed information is in subsection V.A.

The total annual operating costs for the Navy military repair crew and both types of civilian operating crew are less than for a Navy military manned tender. This reflects the lower maintenance costs when the ship is civilian manned. The total economic operating cost estimates for the commercial contract repair crew with either type of civilian operating crew are greater than for a Navy military manned tender. This reflects the high cost of a commercial contract repair crew outlined above.

TABLE 1

MANPOWER COMPARISON

SHIP CLASS	NAVY MILITARY MANNING	NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
		NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE	392	201	159	201	159
AFS	435	201	163	201	163
AD Operating Crew	291	221	213	221	213
AD (Military Repair Crew)	1114	1042		1042	
AD (Civilian Repair Crew)	N/A	946		946	

TABLE 2

MANPOWER COST SUMMARY

ANNUAL MANPOWER FYDP COST SUMMARY*
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	8,982	7,635	6,836	5,613	9,954	8,013
AFS	10,210	8,678	7,673	6,274	10,572	8,373

ANNUAL MANPOWER ECONOMIC COST TO DOD*

(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	7,502	6,376	7,078	5,724	9,827	7,842
AFS	8,502	7,226	8,030	6,370	10,499	8,155

ANNUAL MANPOWER ECONOMIC COST TO U.S. GOVERNMENT

(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	7,873	6,692	7,113	5,768	9,862	7,886
AFS	8,925	7,586	8,049	6,416	10,518	8,201

* Includes Military Detachment

** AE-26 Navy military manning is based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

TABLE 3

TOTAL OPERATING COST SUMMARY

ANNUAL FYDP OPERATING COST
(FYDP $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	19,871	18,420	20,994	19,428	23,631	21,460
AFS	26,815	25,165	21,212	19,851	23,667	21,625

ANNUAL ECONOMIC OPERATING COST TO DOD
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	17,454	16,328	17,717	16,259	20,493	18,405
AFS	23,171	21,896	18,182	16,472	20,682	18,289

ANNUAL ECONOMIC OPERATING COST TO U.S. GOVERNMENT
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	17,825	16,644	17,752	16,303	20,528	18,449
AFS	23,595	22,256	18,201	16,518	20,701	18,335

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

TABLE 4

AD-37 MANPOWER COST SUMMARY*

COST MEASURE	NAVY MILITARY MANNING		NAVY CIVIL SERVICE (NECC) OPERATING CREW WITH			COMMERCIAL CONTRACT (NECC) OPERATING CREW WITH		
(YEAR $)	FULL SMD	85% SMD	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW: FULL SMD	NAVY MILITARY REPAIR CREW: 85% SMD	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW: FULL SMD	NAVY MILITARY REPAIR CREW: 85% SMD
ANNUAL MANPOWER FYDP COST (FY82$K)	$35,102	$29,837	$53,165	$33,191	$29,006	$56,423	$36,449	$32,264
ANNUAL MANPOWER ECONOMIC COST TO DOD (FY82$K)	$29,956	$25,463	$52,950	$29,274	$25,685	$56,151	$32,474	$28,885
ANNUAL MANPOWER ECONOMIC COST TO US GOVT (FY82$K)	$31,430	$26,716	$53,020	$30,451	$26,685	$56,221	$33,651	$29,886

*Includes MILDET

TABLE 5

AD-37 TOTAL OPERATING COST SUMMARY*

COST MEASURE	NAVY MILITARY MANNING		NAVY CIVIL SERVICE (NECC) OPERATING CREW WITH			COMMERCIAL CONTRACT (NECC) OPERATING CREW WITH		
(YEAR $)	FULL SMD	85% SMD	COMMERCIAL CONTRACT REPAIR CREW*	NAVY MILITARY REPAIR CREW: FULL SMD*	NAVY MILITARY REPAIR CREW: 85% SMD*	COMMERCIAL CONTRACT REPAIR CREW*	NAVY MILITARY REPAIR CREW: FULL SMD*	NAVY MILITARY REPAIR CREW: 85% SMD*
AVERAGE ANNUAL OPERATING	59,426	53,759	58,822	43,568	39,736	61,600	46,347	42,515
FYDP COST (FY82$K)			63,236	47,982	44,150	65,972	50,719	46,887
ANNUAL OPERATING	49,517	45,024	63,827	40,151	36,562	67,059	43,383	39,793
ECONOMIC COST TO DOD (FY82$K)			64,714	41,038	37,449	67,937	44,261	40,672
ANNUAL OPERATING	50,991	46,277	63,897	41,328	37,562	67,129	44,560	40,794
ECONOMIC COST TO US GOVT (FY82$K)			64,784	42,215	38,449	68,007	45,438	41,672

* Costs estimated with M. Rosenblatt & Son, Inc. ship habitability modification (CIVMOD) cost are on left; costs estimated with MSC CIVMOD cost are offset to the right.

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I. INTRODUCTION

A. BACKGROUND

The concept of employing civilian seafarers aboard the modern U.S. Navy auxiliary ships and service craft had its beginning in 1970. Concerned with the rising operating and replacement costs of fleet support ships, the Office of the Chief of Naval Operations (OPNAV) initiated a joint study with the U.S. Maritime Administration (MARAD) and the Military Sealift Command (MSC) at the Center for Naval Analyses (CNA). The object of that study was to examine the feasibility of using civilian crewed, modified merchant type ships as a substitute for Navy military operated fleet support ships. While all participants agreed that civilian manning of less sophisticated fleet support ships was a viable alternative, they disagreed on how to implement such a program.

As a result of the CNA study, the Chief of Naval Operations (CNO) directed a series of tests (designated CHARGER LOG) that utilized civilian manned ships for fleet logistic support. Three of these seven tests are noteworthy: CHARGER LOG I used a contemporary merchant tanker (SS ERNA ELIZABETH) with its normal crew to demonstrate the feasibility of refueling combatant ships (including aircraft carriers) in an emergency. However, the test, which lasted six months and was conducted in the Atlantic and Mediterranean areas, also indicated that the Navy's specialized fleet oilers are better suited to routine fueling operations.

CHARGER LOG II replaced Navy military crewman aboard an ex-U.S. Navy fleet oiler with Navy civil service mariners. The success of this test resulted in the transfer to MSC of additional fleet oilers which were also manned with Navy civil

service mariners. CHARGER LOG V was a test and transfer to MSC of one fleet stores ship (AF), two cable layers (ARC), and four fleet tugs (ATF).

In January 1977, the Office of the Chief of Naval Operations (OP-04) directed an in-house study to examine the costs, risks, capabilities, and benefits of civilian manning of fleet support ships[3/]. The three manning options considered were Navy military personnel, Navy civil service mariners, and commercial contract mariners. The results of this analysis were published in a March 1978 report entitled, "Investigation of the Potential for Increased Use of Civilian Manning in Fleet Support Ships (CIVMAN)".

CIVMAN drew no conclusions, but presented documented findings for consideration by the decision maker. The findings indicated that Navy civil service manning yielded cost savings, and that civilian manning would reduce Active Duty Navy billet requirements. In addition, CIVMAN presented analyses of the mission fulfillment capabilities, operational risks, and fleet support policies with respect to the utilization of civilian manning.

In October 1981, the Office of the Assistant Secretary of Defense (Manpower, Reserve Affairs, and Logistics) directed a study of civilian manning of AE, AFS, and AD type auxiliaries which is documented in this report. This study is a comprehensive analysis of the manpower requirements, mission capabilities, operational issues, and costs involved in utilizing civilians on the AE (ammunition), AFS (combat stores), and AD (destroyer tender) type ships. Three major new efforts have been

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[3/]Office of the Chief of Naval Operations, "Investigation of Potential for Increased Use of Civilian Manning in Fleet Support Ships (CIVMAN)," Ser 96/S 590196, March 21, 1978.

incorporated into the analysis: the independent development of Notional Equal Capability Crews (NECC) to evaluate the civilian crews proposed by MSC, the analysis of civilian manned AD Repair Department, and the development of a Notional Modified Crewing Concept for commercial contract manning which follows more closely the Navy's stated requirements.

In a 5 August 1982 statement, the Transportation Secretary announced additional elements of the Administration's maritime policy initiatives intended to bolster the competitiveness and capabilities of the nation's shipping and shipbuilding industries. One of the elements specifies: "The Department of Defense will continue its efforts to expand appropriate use of civilian non-government seafarers to crew government ships."[4/]

B. APPROACH

The analysis for all three ships was divided into four major areas: Manpower, Capability, Operations, and Cost.

1. Manpower

The manpower analysis produced a crew list on a billet-by-billet basis for both Navy military and civilian crews on each ship, and developed a Notional Modified Crewing Concept for commercial contract manning tailored to the requirements found in Navy's ROC/POE statements.

For the Underway Replenishment (UNREP) ships, the Navy military crew was derived from the Ship Manpower Document (SMD). An NECC was then developed for the civilian options. This crew was designed to be able to man an UNREP ship, so that it would meet

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[4/]U.S. Department of Transportation, Office of Public Affairs, News, DOT 29-82, August 5, 1982.

the required Navy capability (from the SMD crew) to steam the ship and deliver the cargo. The NECC also limited the Military Detachment aboard each ship to those personnel necessary for functions which the Navy indicated must be performed by uniformed personnel. The Military Sealift Command also proposed a crew for each ship. The evaluation of the capability of these crews became a subject for the Capability Analysis section.

For the destroyer tender, the Navy military crew again was taken from the SMD. An NECC was developed for the operating crew (based on SMD manning) and the Repair Department (based on required SMD maintenance capability). MSC provided a crew list for the operating crew only.

2. Capability

For the UNREP ships, the capability analysis evaluated the Navy military and civilian crews for their capacity to meet the Navy's required services which are documented in the ROC and POE statements. The proposed MSC crews were evaluated against the NECC to determine the number of replenishment stations each crew could man simultaneously. Also the Navy military and civilian crews were compared in order to address the UNREP endurance capability in sustained operations.

In the case of the destroyer tender, the Navy ROC and POE were reviewed to determine the impact of conversion to civilian manning. MSC and an independent naval architect were asked to examine the feasibility of converting the AD-37 to civilian habitation standards.

3. Operations

The operations analysis developed Notional Deployment Schedules for the Navy military and civilian manned ships. This allowed the estimation of changes in annual time required for maintenance, training, cargo consolidation, and availability for

UNREP duty at sea resulting from permanent overseas deployment of civilian manned ships. The Notional Schedules were compared to actual fleet days at sea to understand the relationship between service days available and service days required in peacetime.

For the AD, actual fleet days in port were compared to AS type ships. The AS days in port were computed separately for ballistic missile submarine tenders and attack submarine tenders. Ballistic missile submarine tenders have been homeported overseas, while attack submarine tenders have been rotated to forward locations and back to CONUS in a similar pattern to the AD.

4. Cost

For the UNREP ships, the cost analysis of each manning option developed the budgetary cost (or FYDP cost) and the true economic cost for the manpower as well as the operations, maintenance, and civilian modification costs.

For commercial contract manning, a cost estimate was developed for the National Modified Crew Concept. In addition, a breakeven cost analysis was conducted to determine what changes would be needed to reduce commercial contract manpower costs to the point where they equal Navy civil service manpower costs.

A similar cost analysis was conducted for the tender. A separate cost estimate was developed for the civilian repair crew. MSC and an independent Naval architect were asked to develop cost estimates for the ship modification of civilian operating crew habitation spaces.

C. ASSUMPTIONS

The following assumptions were made in the conduct of the study:

1. The analysis compares peacetime operations under each of the three manning options. Budget decisions regarding civilian manning must be based on current (peacetime) costs.

2. Readiness Condition IV includes the opportunity for eight hours of rest per man per day and an expected crew endurance of 60 continuous days.

3. The NECCs for the TAE and TAFS are to employ adequate numbers of civilian seamen at appropriate skill levels to satisfy the ROC and POE statements prepared by OPNAV.

4. The SMD for each class of Navy military crewed ship is the basis for determining the essential work functions to be performed aboard a civilian manned ship.

5. The communications, medical and dental, ordnance security (on the TAE and TAD), and explosive ordnance disposal (on the TAE) functions are military manned.

6. Civil service and commercial contract crews do not man self defense stations.

7. Each ship in this study is assumed programmed for civilian modification in FY 1984.

8. Where worldwide operational or cost data is unavailable, Atlantic Fleet and East Coast data is used.

9. Underway replenishment capability is determined by the number of replenishment stations manned and operating.

II. MANPOWER ANALYSIS

This section documents the number and skill requirements of personnel necessary to man AE-26, AFS-1, and AD-37 class ships with Navy military, Navy civil service, and commercial contract seamen. For clarity, the Underway Replenishment (UNREP) ships and the destroyer tender are discussed separately. These discussions are followed by a summary of the two civilian manning options and a Notional Modified Crewing Concept for commercial contract manning that is amenable to Navy fleet support ship requirements. Following this summary is a discussion of the manpower, personnel, and training consequences to the Navy that would result from civilian manning of these three ship classes.

A. UNDERWAY REPLENISHMENT (UNREP) SHIPS

The development of crew lists for the UNREP ships consisted of three steps: first, the Ship Manpower Document (SMD) and Manpower Allowance (MPA) were reviewed to determine the Navy manpower requirements and allocations. Then, a methodology was developed to derive a Notional Equal Capability Crew (NECC), which is a manning scale that is equivalent to the Navy military crew in the UNREP ships' two essential mission areas, mobility and replenishment at sea. Finally, the proposed MSC crews for these ships were obtained.

1. Navy Military Manning

This subsection begins with a review of the Navy manpower analysis process and documents the selection of the Navy military crew by the study group.

a. Navy Manpower Analysis Process

Navy planners prepare Projected Operational Environment (POE) statements and Required Operational Capability (ROC) documents

for Navy ships by classes and designated missions. The ROC/POE provides the basis for determining the Navy military manpower requirements described in the Ship Manpower Document (SMD).[5]

The SMD assigns each officer and seaman to a station for each condition of readiness prescribed for the ship. The SMD is the basis for a Manpower Authorization (MPA) prepared by OPNAV. The MPA specifies the authorized numbers and skill levels for ratings allocated to the ship within end strength constraints. In peacetime, planned authorizations may fall short of SMD mobilization requirements in total crew numbers or they may fall below the specified skill levels.

b. Navy Military Crew Selection

The SMD crew was chosen as the Navy military crew for the AFS-1 class ship because it is the official expression of the manning requirements. The SMD contains a watch and station bill which describes the UNREP personnel requirement at the position level.[6] This became the basis for the derivation of the NECC, as explained below.

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[5] Office of the Chief of Naval Operations, "Guide to the preparation of Ship Manning Documents, Volume I: Policy Statement," Ser 10470P10, February 3, 1971.

[6] Office of the Chief of Naval Operations, Instruction (OPNAVINST) 5320.228A, June 6, 1980.

The AE-26 POE requires six CONREP stations and one VERTREP station, while the TAE-26 POE requires five CONREP stations and one VERTREP station.[7] Both POE/ROCs require the capability of an additional fleet freight handling station. It is not clear, however, in either case whether this station must operate simultaneously with the ammunition handling stations. It is known that the Navy military manned option SMD provides personnel for the simulatenous manning of this station while the MSC Navy civilian manned ship does not. The AE-26 SMD[8] Watch and Station Bill requires seven CONREP stations and one VERTREP station. Since the objective of the analysis was to make an equal capability comparison, the AE-26 SMD crew level was reduced to a five CONREP and one VERTREP station capability by removing 24 men. These 24 men fill two rig temas in the SMD Watch and Station Bill. Similarly, the AE-26 POE was reduced by one CONREP station to obtain a capability equal to the TAE-26 POE.

The 24 man reduction made the SMD roughly equal to the MPA.[9] Since the objective was to measure civilian crew capability, the Navy military SMD was reduced in size to approximate the crew responding to the civilian manned POE.

Table 6 is a summary of organizational Navy manpower requirements for the AFS-1 and AE-26 class UNREP ships used in this study.

7/ OPNAVINST 3501.130, May 21, 1979; OPNAVINST 3501.15A, April 7, 1980.

8/ OPNAVINST 5300.121A, January 6, 1981.

9/ OPNAV 1000/2, Activity Code 0128-0028-00, February 7, 1982.

TABLE 6

NAVY MILITARY MANNING
SMD LEVEL

	OFFICER	CPO	ENLISTED
AE-26*	18	22	352
AFS-1	23	22	390

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

2. Civilian Manning

This subsection presents the methodology used to develop the NECC and the resulting crews as well as the proposed MSC crews.

a. Notional Equal Capability Crew (NECC)

An NECC for an UNREP ship is a civilian crew list designed to meet the ROC/POE requirements (listed in Table 7)[10/] for a civilian manned ship. This list was developed from a functional analysis of the Navy SMD. The NECC is the basis for comparison of a the capabilities of the proposed MSC civilian crew and the Navy military crew.

The NECCs were derived taking these factors into account.

The Navy MILDETs are permanent assignments. The Navy military personnel who operate and maintain embarked helicopters are not included in the MILDET in this analysis: the HELODET (Helicopter Detachments) is a separate command entity, reporting onboard for

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10/ OPNAVINST 3501.130, May 21, 1979; OPNAVINST 3501.153, November 5, 1981.

duty when the ship is available for replenishment operations. The HELODET is not included in the SMD nor was it included in the Navy military crew in this study.

TABLE 7

SUMMARY OF POE/ROC UNREP REQUIREMENTS
AT SEA DURING WARTIME

MSC MANNING

	STATIONS*	STATIONS	HOURS/WEEK/STATION (NOT TO EXCEED)
TAE-26	2 stbd, 3 port	1 (2 helos)	32
TAFS-1	2 stbd, 3 port	1 (2 helos)	32

*POE requires one additional station (port or stbd) to be manned as needed for transfer of light freight, mail, personnel, etc.

SOURCE: OPNAV INSTR. 3501.130 (TAE-26)
OPNAV INSTR. 3501.153 (TAFS-8)

(1) TAE-26 class NECC. Table 8 shows the NECC for the TAE-26 class ship and the support MILDET. Appendix A contains a detailed list of crew members and a six-station watch and station bill showing the assignment of civilian seamen and selected MILDET personnel to watch and underway replenishment stations. Merchant marine manning practices were followed in the assignment of crew members to ship and machinery control stations for cruising conditions. During underway replenishment operations, the ship control and machinery control stations were augmented with additional crewmen in order to ensure safe and reliable ship operation. Compared to the military manned ship, there is a substantial reduction in numbers of positions manned.

Replenishment control stations in the NECC are crewed man-for-man except that functional analysis of the military-manned UNREP positions indicated that the distant line handler and talker can be double-hatted when civilian manned.

TABLE 8 - NECC MANNING SUMMARY

TAE-26 CLASS

FUNCTION	NUMBER OF PERSONNEL REQUIRED	TOTAL PERSONNEL SUBTOTAL
LICENSED OFFICERS		
Deck	6	
Engine	9	
	15	
Subtotal		15
UNLICENSED SEAMEN		
Deck	93	
Engine	27	
Steward	27	
Purser/Medical	2	
Supply	5	
	154	
Subtotal		154
TOTAL CIVILIAN CREW		169
NAVY MILDET		
Officers	2	
Enlisted	30	
	32	
Subtotal		32
TOTAL AGGREGATE MANNING		201

(2) TAFS-1 class NECC. Table 9 is the NECC manning for the TAFS-1 class ship and supporting MILDET. The detailed crew list and watch and station bill are shown in Appendix B. The manning methodology and allocation of personnel for both cruising and underway replenishment operations is similar to that used for the TAE-26 class ship.

TABLE 9

NECC MANNING SUMMARY

TAFS-1 CLASS

FUNCTION	NUMBER OF PERSONNEL REQUIRED	TOTAL PERSONNEL SUBTOTAL
LICENSED OFFICERS		
Deck	6	
Engine	9	
	15	
Subtotal		15
UNLICENSED SEAMEN		
Deck	87	
Engine	26	
Steward	26	
Purser/Medical	2	
Supply	27	
	168	
Subtotal		168
TOTAL CIVILIAN CREW		183
NAVY MILDET		
Officers	1	
Enlisted	17	
	18	
Subtotal		18
TOTAL AGGREGATE MANNING		201

b. Proposed MSC Crews

Table 10 is the Commander, Military Sealift Command (COMSC) manning summary for the USNS KILAUEA (TAE-26). This ship was transferred to MSC and joined the Seventh Fleet in 1982.

TABLE 10

MSC MANNING SUMMARY

USNS KILAUEA (TAE-26)

FUNCTION	NUMBER OF PERSONNEL REQUIRED	TOTAL PERSONNEL SUBTOTAL
LICENSED OFFICERS		
Deck	6	
Engine	7	
	13	
Subtotal		13
UNLICENSED SEAMEN		
Deck	44	
Engine	27	
Steward	31	
Purser/Medical	3	
Supply	3	
	108	
Subtotal		108
TOTAL MSC CREW		121
NAVY MILDET		
Officers	3	
Enlisted	35	
	38	
Subtotal		38
TOTAL AGGREGATE MANNING		159

There are some minor billet changes from CIVMAN, but both the previous study and the present MSC list have the same number of men. Table 11 is the proposed manning for the TAFS-1, which was used in CIVMAN. Appendices A and B show the detailed MSC manning for the TAE-26 and TAFS-1 class ships, respectively.

TABLE 11

MSC PROPOSED MANNING SCALE

TAFS-1 CLASS

FUNCTION	NUMBER OF PERSONNEL REQUIRED	TOTAL PERSONNEL SUBTOTAL
LICENSED OFFICERS		
Deck	6	
Engine	6	
	12	
Subtotal		12
UNLICENSED SEAMEN		
Deck	49	
Engine	28	
Steward	27	
Purser/Medical	2	
Supply	7	
	113	
Subtotal		113
TOTAL MSC CREW		125
NAVY MILDET		
Officers	5	
Enlisted	33	
	38	
Subtotal		38
TOTAL AGGREGATE MANNING		163

B. DESTROYER TENDER

This subsection presents the Navy military crew, describes the derivation of the NECC for the operating crew and the repair crew, and concludes with the proposed MSC operating crew.

1. Navy Military Manning

The SMD crew was used as the basis for the Navy military crew for the AD.[11]/ The SMD contains a watch and station bill describing operating crew requirements at the position level. In addition, the AD-37 SMD provides a Functional Workload breakdown at the Work Center level for the repair crew. The watch and station bill and the Functional Workload breakdown were the basis for the NECC.

The AD-37 requires a crew of 44 officers, 134 CPOs and 1227 other enlisted personnel.

Table 12 is the manpower summary by major organizational component.

TABLE 12

AD-37 SMD MANPOWER SUMMARY BY ORGANIZATIONAL COMPONENT

Grade	Operating Crew	Repair/Weapon	Supply	Med/Dental
Officer	18	13	6	7
Enlisted	250	976	119	16
TOTAL	268	989	125	23

2. Civilian Manning

a. Notional Equal Capability Crew (NECC)

An NECC for the destroyer tender is a civilian crew list designed to meet the POE and SMD requirements for a Navy military

11/ OPNAVINST 5320.434 (DRAFT).

manned ship. This list was developed from a functional analysis of the Navy SMD.

The earlier CIVMAN study examined the feasibility of substituting both types of civilian mariners for the Navy military operating crew. The Repair, Weapons Repair, Medical, Dental, Supply, and Communications Departments were assumed to be manned with Navy military personnel.

This study was directed to reexamine the use of civilian personnel aboard the AD-37 in both the operating and the repair crews. The NECC was developed separately for both the operating and repair crews. The repair functions are basically workload-driven, while the operating crew functions are watch station-driven. Neither the MSC nor the commercial contract civilian sea-going labor force has personnel with the skills required for the Repair Department functions. These personnel are found in the shipbuilding and ship repair industry. Consultation with Navy planners resulted in the recommendation that the Medical, Dental and Communications Departments would be manned with Navy military personnel.

(1) Operating crew. Table 13 is the proposed NECC for the operating crew of the TAD-37 class destroyer tender. A breakdown of each department to show grade and skill levels is contained in Appendix C. Beyond providing manpower to operate Ship and Engine Control stations, the NECC also provides all hotel services (including laundry support) as well as deck and engine personnel to operate the ship's boat when at anchor.

TABLE 13

ORGANIZATIONAL MANNING SUMMARY
NECC

Department	Licensed	Unlicensed
Deck	5	26
Engine	7	26
Steward		99
Purser		2
	12	153

A watch and station bill showing the allocation of NECC mariners to underway and inport watch stations is included in Appendix C, along with the NECC roster of manpower requirements.

(2) Repair and Weapons Repair Departments. The AD-37 SMD contains a functional workload breakdown of manhours required to perform planned maintenance, corrective maintenance, customer support, service diversion, and training. This is presented at the Work Center level and is therefore easily relatable to the qualitative and quantitative manpower requirements of the Repair Departments. The functional workload table was the basis for the estimation of the size and composition of a TAD-37 NECC repair crew.

In order to determine the NECC that would sustain the AD-37 wartime repair capability, the total hours allocated in the SMD functional workload breakdown for each work center were adjusted by subtracting hours allocated for service diversion and training. Service diversion is the allowance made for productivity lost for military ceremonies and purely military duties. Training represents productive time lost in providing or receiving on-the-job training. Such factors are necessary for a military crew but not for a civilian crew. The remaining workload hours are those allocated for in-house planned and corrective maintenance and customer support. SMD workload calculations include a productivity allowance of 20 percent, which is applied to basic productive work requirements to reflect delays arising from fatigue, environmental effects, personal needs, and unavoidable interruptions which serve to increase the maintenance time. It is noted that the SMD contains additional billets for storekeepers and associated support personnel to manage material resources. These billets were reviewed and converted to an equivalent civilian manning level. The results are included in the final tabulation of the NECC in Table 14.

The standard work week used as the basis for computations in generating the Navy SMD (OPNAVINST 5320.434 DRAFT) for the AD-37 is 62 hours. To determine an NECC which meets manpower requirements, the total adjusted functional workload hours per manweek is divided by 62 hours. The NECC is shown in Table 14 by mission area and grade level.

The qualitative NECC manpower requirements shown in Table 14 were determined by equating the Navy military rating structure specified in the SMD with the civilian job titles shown in Table 15. Military occupations used in the Repair, Weapon Repair, and parts of the Supply Departments of the AD-37 were converted to Department of Defense Occupational Codes using the DOD Occupational Conversion Manual, DOD 1312.1-M.[12] Table 14 entries define the grades, numbers, and expertise of the civilian workforce needed to replace the Navy military workforce.

To provide a complete comparison, it was assumed that the TAD repair crew also could be manned with Navy military personnel. The military crew required is derived from the SMD and consists of the Repair and Weapon Repair Departments as well as the Supply Department personnel from Work Centers S-1, S-4, and S-7. This totals 1042 billets. A detailed breakdown is shown in Appendix G.

b. Proposed MSC Ship Crew

COMSC amended the proposed TAD-37 operating crew submitted for CIVMAN. Appendix C contains the manning by grade and skill level. Table 16 is a summary of this proposed crew at the department level. As previously mentioned, CIVMAN assumed a military manned Repair Department. Therefore, the MILDET in Table 17 is the same as that used in the NECC.

12/ Department of Defense, Occupational Conversion Manual, September 1980, pp. xi-xvii.

TABLE 14

NECC MANNING SUMMARY
REPAIR & WEAPONS DEPARTMENTS
TAD-37 CLASS

MISSION AREA	SUPERIN-TENDENT	SUPER-VISOR	FORE-MAN	JOURNEY-MAN	APPREN-TICE	TOTAL
Management	3	9	15	33	25	85
Gen. Deck Services		1	1	7	7	16
Electronic Repair		12	28	46	63	149
Technical Specialities		6	10	28	31	75
Functional Support Admin.		2	4	5	27	38
Electrical/ Mechanical Repair		30	45	98	120	293
Craftsmen/ Metal Workers		17	32	75	166	290
TOTAL	3	77	135	292	439	946

TABLE 15

NAVY MILITARY/CONTRACT CIVILIAN
SKILL LEVEL CONVERSIONS

NAVY MILITARY RATING	CONTRACT CIVILIAN GRADE LEVEL
CPO (M) (E-9)	Superintendent
CPO (S) (E-8)	Supervisor
CPO (E-7)	Supervisor/Foreman
PO 1 (E-6)	Foreman/Journeyman
PO 2 (E-5)	Journeyman
PO 3 (E-4)	Apprentice
SN/FN (E-3)	Apprentice

TABLE 16

MSC PROPOSED MANNING SUMMARY

TAD-37 CLASS

FUNCTION	NUMBER OF PERSONNEL REQUIRED	TOTAL PERSONNEL SUBTOTAL
LICENSED OFFICERS		
Deck	5	
Engine	7	
	12	
Subtotal		12
UNLICENSED SEAMEN		
Deck	21	
Engine	19	
Steward	93	
Purser	2	
	135	
Subtotal		135
TOTAL MSC CREW		147
MSC AUGMENT (BOAT DETACHMENT)		
Deck	5	
Engine	5	
	10	
Subtotal		10
TOTAL MSC AUGMENTED CREW		157
NAVY MILDET		
Officers	10	
Enlisted	46	
	56	
Subtotal		56
TOTAL AGGREGATE MANNING		213

C. CIVILIAN MANNING OPTIONS

This subsection presents the highlights of the two civilian manning options and develops a Notional Modified Crewing Concept for commercial contract manning designed for auxiliary ship operations.

1. Navy Civil Service Manning

COMSC has been manning and operating former USN auxiliary ships since 1972. MSC civilian mariners are specially trained for fleet support work and are reassigned to the same type of ship whenever possible. MSC maintains complete control over employment, assignment, significant workrules, etc. However many MSC civil service mariners are active union members. In addition, MSC requires all civil service mariners to possess valid U.S. Coast Guard licenses or certificates as a condition of employment.

2. Commercial Contract Manning

a. Background

Commercial contract operation of auxiliary ships is the subject of interest to the Merchant Marine community. COMSC operates sealift type ships under commercial contract. However, these ships are engaged in point-to-point operations rather than fleet support.

As with their Navy civil service mariners, MSC has complete control over employment terms, such as assignments and significant workrules. Recently, MSC issued a Request for Proposal (RFP) for the contract operation of U.S. Government-owned T-1 tankers. In this RFP, MSC exercised its rights to establish quality control over proposed crewing and to affirm workrules that in effect require a dedicated manning concept.[13/] This is further explained in subsection c below.

13/ COMSC Negotiated Procurement MSC RFP No. N00033-82-R-3004; "Operation of T-1 Class Tankers," dated May 28, 1982.

b. Current Commercial Contract Operations

Civilian seamen (licensed officers and unlicensed personnel) who crew commercial U.S. flag ships must have a license or a certificate issued by the U.S. Coast Guard Merchant Marine Inspection Service. Both licenses and certificates are issued only after an extensive examination of the mariner's knowledge. The personnel are upgraded after sufficient experience at sea to qualify for advancement or after the reissuing of the original license or certificate.

A licensed officer obtains his position either by advancement from an unlicensed entry category or after education and training at a Federal or State Maritime Academy. Unlicensed seamen enter as apprentices in either the Deck, Engine, or Steward Departments and advance in the department which offers a satisfactory career. Retired and ex-Navy and Coast Guard personnel with sufficient seagoing experience can enter the maritime sea-going labor force, but only after satisfying U.S. Coast Guard requirements for the position for which they seek a license or certificate.

The majority of commercial contract seamen are maritime union members. The main institution in the union hierarchy is the hiring hall which assigns men to ships and regulates the flow of mariners from sea to shore and vice-versa. Commercial ship owners and operators negotiate contracts with multiple maritime unions representing licensed and unlicensed seamen to meet their crewing needs.

Navy spokesmen frequently express concern over negotiations with multiple unions having diverse interests should U.S. government owned fleet support ships be commercially manned and operated. However, the Defense Acquisition Regulations (DAR) require that MSC offer "bare boat" charters of U.S. government owned ships in Request for Proposals (RFP) to qualified commercial ship owners/operators for commercial contract operation. Successful responders have the responsibility to conduct all maritime union negotiations to obtain a crewing contract subject to the conditions specified in the RFP by COMSC.

The commercial ship operator who successfully concludes an RFP has the responsibility to negotiate manning contracts with the Maritime Unions subject to MSC oversight. This was done with the operation of U.S. government-owned commercially operated T-1 tankers.

The Navy has noted the need for specific training in fleet support equipment and techniques for civilian seamen serving aboard auxiliaries. In addition, the Navy has addressed the question of standard commercial contract crew rotation applied to auxiliaries. In the merchant marine, this generally results in a crewman holding a billet for six months, then relinquishing it to another crewman. In recent years, commercial contract mariners have developed dedicated crews for certain specialized ships (such as Liquified Natural Gas Ships).

CIVMAN examined the legal aspects of commercial contract operation of support ships. In the opinion of the Office of the General Counsel, Department of the Navy, specific Congressional legislation would be required to allow commercial contract operation of support ships. This impediment does not apply to ships engaged in point-to-point operations.14/

Command and Control relationships between Navy force and unit commanders and civilian crewed fleet support ships is of concern to Naval planners. The issue is the disciplinary control which can be exercised over Navy civil service and commercial contract seamen aboard fleet support ships in peacetime, contingency, or wartime. COMSC contends that the degree of disciplinary control over contract seamen is not direct compared to Navy military or civil service crewmen. This indicates an area for contractual negotiations and remedies.15/

14/ Department of the Navy, Office of the Judge Advocate General, Ser 13/5492, May 19, 1977 (see CIVMAN, Appendix G, Tab B.)

15/ COMSC Memorandum Ser 50 M31 of October 4, 1977 (See CIVMAN, Appendix G, Tab D).

c. Notional Modified Crewing Concept

With regard to specific auxiliary ship requirements, major union leaders propose the use of dedicated manning. This concept envisions the use of dedicated mariners to provide crews for a particular auxiliary ship. Seamen placed in a dedicated crew would be selected, trained, and certified in the UNREP ship equipment and procedures. The concept sponsors further suggest that the union working rules are negotiable and include salaries, benefits, vacation time, etc. Dedicated manning reduces the number of men requiring training and background investigations.16/

With regard to possible implementation, COMSC is the sole contracting officer for all sealift services for the Department of Defense. If auxiliary ship contract manning becomes a viable alternative to Navy civil service manning, COMSC would issue an RFP. Responders would be required to satisfy COMSC that fully qualified, competent seamen would be used to crew the offered ships.

As an example, crew size and work rules were established by COMSC in a recent MSC RFP for contract operation of T-1 class tankers.17/ COMSC defines the minimal skill and grade level of seamen in the Deck and Engine Departments to meet requirements of the U.S. Coast Guard and MSC. Further, COMSC required that all seamen employed in the offered ships be "servants" of contractor during the contract period (three years). Reliefs for

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16/ For further details concerning this discussion, see Appendix D.

17/ COMSC Negotiated Procurement MSC RFP No. N00033-82-R-3004; "Operation of T-1 Class Tankers," dated May 28, 1982.

vacations, illnesses, etc., were to be provided by the contractor. These replacement personnel were to be rotated among the ships being offered. Personnel were to be reemployed upon the completion of their leave, and continuity of the original crew was to be ensured. These requirements indicate that the contract operation of fleet support ships would also require dedicated-type manning if a responder is to be qualified to operate the ship.

d. Training Requirements

U.S. Navy fleet support ships must interface with combat ships at sea, integrate into naval formations, and transfer cargoes at sea. Because Navy fleet auxiliaries are special mission ships, the crews must be trained to be able to engage in fleet support operations, as explained in detail in NWP 14 Replenishment at Sea.[18]/

Breakbulk merchant ships and the U.S. Navy's underway replenishment ships have some ship control and propulsion features in common, but auxiliary ship cargo storage, shipboard handling, and cargo transfer capabilities are more complicated and demanding in comparison to merchant ship systems.

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[18]/ Office of the Chief of Naval Operations, "Replenishment at Sea, NWP-14 (Revision A)," November 1979.

The principal peculiarities attending mobile logistic support requirements are centered in the Deck and Supply Departments. Some special requirements are also imposed on the Engine and Steward Departments in connection with positioning the ship and the transfer of cargo.

In view of the special mission requirements of auxiliaries, it is reasonable to assume that deck officers must be trained in their basic qualifications, as well as be trained to be:

- Knowledgeable in the use of Naval warfare and tactical publications, especially those sections that apply to replenishment operations.
- Knowledgeable in the use of the General Signal Book and the execution of orders and instructions conveyed by voice radio, flashing light, and flag hoists.
- Competent in the use of radar plotting, and the use of the tactical maneuvering board.
- Competent in the use of radio telephones and knowledgeable in Navy voice radio procedures.

The special mission requirements and missions on auxiliaries indicate that deck unlicensed seamen must be trained in their basic qualifications, as well as be trained to:

- Have a working knowledge of Naval Warfare Publication 14, "Replenishment at Sea."[19]
- Be proficient in rigging and using STREAM and conventional transfer methods.
- Perform maintenance on STREAM and conventional transfer rigs.

19/ Office of the Chief of Naval Operations, "Replenishment at Sea, NWP 14 (Revision A)," November 1979.

- Maintain and operate shipboard cargo movers.
- Assemble and package cargo for transfer by Connected Replenishment (CONREP) and Vertical Replenishment (VERTREP).

D. MANPOWER AND TRAINING BASE ISSUES

The replacement of Navy military crews onboard auxiliaries raises a number of Navy personnel management issues. The loss of officers' billets creates new problems in establishing career patterns for seagoing officers aspiring to the eventual command of ships and task units. Also, the substitution of civilian seamen for Navy military enlisted personnel makes available critical ratings for assignment to combatant ships, but there is an offsetting loss in training opportunities for deck seamen in the underway replenishment ships and artificers in the destroyer tender Repair Departments.

1. Manpower

a. Navy Officer Career Impact

The most obvious impact of officer billet losses in these ships would be the lost opportunity for acquiring operational experience in deep draft ships. As the size of the fleet has declined in recent years, the relative size of the shore 'tail' has increased. This has created a situation in which about the same number of line officers are competing for assignment to a reduced afloat billet structure, making career management much more difficult. While it can be expected that this situation will ease somewhat as the Navy builds to a 600-ship force over the next decade, there are nevertheless two areas in which the near term loss of a significant portion of the officer billets on these ships would create problems:

- Fleet support ships have historically provided a preliminary training opportunity for prospective commanding officers of major fleet combatants. This is especially true for Aircraft Carriers. To the extent that these ships are converted to civilian manning, this preliminary seasoning opportunity will be lost.

- For surface warfare officers, the department head and division level positions on fleet support ships provide additional opportunities for at-sea experience which is critical to selection for command-at-sea. As the number of surface combatants rises over the next few years, the availability of these billets may be critical to sustaining an orderly growth in the number of experienced surface warfare commanders.

Table 17 shows the loss of officer billets by ship class should civilian crewing be authorized.

TABLE 17

NAVY OFFICER BILLET LOSSES

SHIP CLASS	NO. IN CLASS	GRADE 06	05	04	03	02	01	CW01	CW02	CW03	TOTAL
AE-26	7		7	7	35	21	28	7	7	14	126
AFS-1	7	7	14	21	35	28	49		7	14	175
AD-37	2	2	8	10	22	8	8	4	6	8	76
TOTAL		9	29	38	92	57	85	11	20	36	377

SOURCE: MANPOWER AUTHORIZATION (OPNAV 1000) AE-26 dtd 11/04/81
AFS-1 dtd 03/20/80
AD-37 dtd 01/07/82

b. Petty Officer Shortages

The Navy is experiencing a critical shortage of experienced petty officers. This is particularly true for journeyman skill levels (E4-E6). Table 18 displays the grade distribution and total billets by ship class for the three ships under study. Of

the 7826 billets involved, 3845 are at the journeyman level. Thus, if all ships in the three classes were converted, there would be a reduction in total demand at the journeyman level of 3845. For comparison purposes, the Navy currently has structure requirements of approximately 175,000 in pay grades E4-E6.

TABLE 18

ENLISTED RATING BILLET LOSSES

SHIP CLASS	NO. IN CLASS	PAY GRADE E9	E8	E7	E6	E5	E4	E3	TOTAL
AE-26	7	14	14	133	203	336	574	1337	2611
AFS-1	7	14	14	126	273	434	609	1379	2849
AD-37	2	20	34	132	308	454	654	764	2366
TOTAL		48	62	391	784	1224	1837	3480	7826

SOURCE: MANPOWER AUTHORIZATION (OPNAV 1000) AE-26 dtd 02/04/82
AFS-1 dtd 02/05/82
AD-37 dtd 02/08/82

It is particularly relevant to consider the potential impact of civilian manning on those ratings in which significant shortages currently exist. The Navy classifies ratings in terms of the magnitude of current enlisted inventory shortfalls as a means of focusing its reenlistment efforts. Thus, these Career Reenlistment Objective (CREO) Groups accurately reflect current shortages. CREO Groups A (Inventory Less than 80% of requirements) and B (Inventory between 80% and 90% of requirements) contain those ratings on which shortages are most critical.

TABLE 19

CREO GROUP POPULATION COMPARED TO
CORRESPONDING SUPPORT SHIP BILLETS

CREO GROUP	TOTAL POPULATION E4-E6	AE-26/AFS-1/AD-37 BILLETS	SUPPORT SHIP BILLETS AS PERCENT OF POPULATION
A (80% Manned)	84510	2307	2.73%
B (80% - 89% Manned)	19792	347	1.76%

Table 19 displays the journeyman populations in those ratings which are in Career Reenlistment Objective Groups A and B. The total E4-E6 billets on the AE-26, AFS-1, and AD-37 class ships in these CREO groups are also shown. It will be observed that for those ratings in which Navy-wide journeyman level manning is less than 90%, the support ship billets represent about 2.5% of the available population. Actually, in terms of resources available to improve manning of fleet combatants, the 2654 support ship billets of Table 19 probably only represent 2300 redeployable journeymen because of support ship quantitative and qualitative undermanning: thus, the net impact of civilian manning of all sixteen ships would probably have an overall impact of less than 2% on the CREO statistics.

Table 20 provides detailed journeyman level statistics for all ratings involved on the three ship classes (AE-26, AFS-1, AD-37) which are currently in CREO Groups A and B. Billet breakouts are shown by pay grade and by ship. Also shown are the totals for all 16 ships in the three classes along with the total rating population at the journeyman level and the percent of that population represented by the support ship billets.

TABLE 20

JOURNEYMAN LEVEL BILLET STATISTICS
FOR AE-26, AFS-1, AD-37

RATING	CREO	AE-26 PER HULL	AFS-1 PER HULL	AD-37 PER HULL	TOTAL FOR THREE CLASSES	NAVY RATING POPULATION (E4-E6)	% E4-E6
QM	A	5	4	4	71	2100	3.4
OS	A	7	6	4	99	4864	2.0
ET	A	6	6	78	240	14767	1.6
MM	A	27	27	114	606	19600	3.1
EM	A	11	11	55	264	9740	2.7
IC	A	4	5	25	113	3866	2.2
HT	A	4	4	153	362	6346	5.7
EW	A	0	3	0	21	1530	2.1
DS	A	0	1	1	9	2660	0.3
FTG	A	0	0	17	34	2476	1.3
FTM	A	0	0	2	4	2545	0.2
GMT	A	0	0	13	26	1226	2.1
GSM	A	0	0	3	6	1115	0.5
IM	A	0	0	22	44	270	16.3
OM	A	0	0	9	18	193	9.3
STG	A	0	0	7	14	3253	0.4
TM	B	0	0	18	36	2532	1.4

TABLE 20 (cont.)

JOURNEYMAN LEVEL BILLET STATISTICS
FOR AE-26, AFS-1, AD-37

RATING	CREO	AE-26 PER HULL	AFS-1 PER HULL	AD-37 PER HULL	TOTAL FOR THREE CLASSES	NAVY RATING POPULATION (E4-E6)	% E4-E6
SM	B	6	6	6	96	1638	5.9
RM	B	7	9	10	132	9832	1.3
EN	B	2	2	15	58	4839	1.2
MR	A	1	1	61	136	1498	9.1
BT	A	11	11	42	238	6955	3.4
RP	B	0	1	1	9	417	2.2
GSE	A	0	0	1	2	506	0.4
ML	B	0	0	3	6	90	6.7
LI	B	0	0	3	6	353	1.7
PM	B	0	0	2	4	91	2.7
TOTAL		117	129	710	2658		

2. Training Base Impact

a. Destroyer Tender (AD) Role in Maintaining Skill Proficiency

The AD provides an opportunity for Navy military personnel, especially those enrolled in artificer rates, to improve their skills in Repair and Weapon Repair Work Centers. There is also the added opportunity to observe and participate in planning, execution, scheduling, layout, supervision, production, and quality control involvement with shipboard corrective and preventive maintenance procedures and practices. This background is acquired while aboard ship and serves in enabling the beneficiary to better relate to the shipboard environment.

The rotation of junior and senior repair and weapon repair specialists between the operating combatant ships and the destroyer tender broadens the population of Navy military personnel with managerial and production skills. The impact of civilian manning of the repair facilities aboard the AD-37 would reduce the career enhancing preferred sea duty opportunities for an important segment of Navy military manpower. Civilian manning could encourage destroyer tender oriented Navy military personnel to terminate their military careers in favor of employment in the destroyer tender civilian labor force. The loss to the Navy is inability to phase the AD trained specialists into the operating forces where their services are factors in improved readiness.

b. Deck Seamanship

The fleet support ships, particularly underway replenishment ships, are the training grounds for deck ratings in replenishment at sea skills. Many of these seamen carry these skills into combat ships as they advance their careers.

III. CAPABILITY ANALYSIS

This section analyzes the impact on mission fulfillment capabilities under civilian manning. For the UNREP ships, the analysis consists of three parts. The Required Operational Capabilities (ROC) for each ship when manned by military and civilian personnel is compared to identify the mission areas where the types of manning are not equally capable. Then the proposed MSC crew for each ship is analyzed to determine the ability to meet requirements of the Projected Operational Environment (POE). Finally, the subject of UNREP crew endurance in round-the-clock contingency type operations is addressed.

For the tender, the ROC/POE requirements were analyzed in light of the ability of the NECC to provide capability equal to that of the Navy military repair crew. The analysis uncovered mission areas where the civilian crew capability differed from the Navy military crew capability.

A. UNDERWAY REPLENISHMENT (UNREP) SHIPS

1. Required Operational Capability Analysis

The Required Operational Capabilities (ROC) are general statements of the services required of each ship class. These statements were compared for the Navy Military and civilian manning options.[20/] A summary comparison of ROC statements is shown in Table 21.[21/]

Two military functions (anti-air and anti-surface warfare) are required of these ships when military manned, but not when

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20/ OPNAVINST 3501.130, May 21, 1979; OPNAVINST 3501.153, November 5, 1981; OPNAVINST 3501.15A, April 7, 1980; OPNAVINST 3501.12A, October 29, 1980.

21/ Since the TAFS-1 class is presently Navy military manned, no civilian manned ROC/POE has been prepared. The TAFS-8 class civilian manned ROC/POE was used as a guide for analysis purposes.

civilian manned. Communications, a third military function, is required under both types of manning. This study assumed that communications functions are provided by military personnel when a civil-ian crew is used.

The logistics and fleet support operations must provide the same general services and have the same capabilities in both manning options. The comparison proceeded as follows: the ROCs were listed at the operational capability level in Readiness Condition UR (Underway Replenishment). For each operational capability statement, the component subcapabilities were reviewed to determine the most demanding requirements. This became the determining component. In effect, this ensures that suboperational capabilities requiring lower performance levels will be fulfilled. The summarized ROCs are found in Table 21.

2. Projected Operational Environment Analysis

The AFS and TAFS Projected Operational Environment (POE) require six simultaneous replenishment stations (including VERTREP) operating not more than 32 hours per week. The AE-26 POE requires six CONREP stations plus one VERTREP station, while the TAE-26 POE requires five CONREP stations plus one VERTREP station. Both POEs also require an additional freight handling station, which for the AE operates simultaneously while the Civil Service manning document apparently lacks the personnel to do so. Since the objective of the analysis was to make an equal capability comparison, the AE-26 requirement was reduced to five CONREP stations plus one VERTREP station.[22/] Table 22 summarizes the actual POE requirements.

22/ OPNAVINST 3501.130, May 21, 1979; OPNAVINST 3501.153, November 5, 1981; OPNAVINST 3501.15A, April 7, 1980; OPNAVINST 3501.12A, October 29,1980.

TABLE 21

FLEET REPLENISHMENT SHIPS
REQUIRED OPERATIONAL CAPABILITIES
SYNOPSIS

LEGEND

F - Full capability required
P - Partial capability required
E - Performed by Navy MILDET
NA - Not applicable

MISSION AREA OPERATIONAL CAPABILITIES	AE-26		AFS-1	
	NAVY	CIVILIAN	NAVY	CIVILIAN
ANTI-AIR WARFARE (AAW)				
Engage air targets with gunfire	F	NA	NA	NA
ANTI-SURFACE WARFARE (ASuW)				
Engage surface targets with gunfire	F	NA	NA	NA
INTELLIGENCE (INT)				
Collect intelligence	F	P	F	P
MOBILITY (MOB)				
Steam to designed capability	F	F	F	F
Prevent and control damage	F	F	F	F
Maneuver in formation	F	F	F	F
Replenish at sea	F	F	F	F
Maintain the health and well being of crew	F	F	F	F
COMMAND & CONTROL & COMMUNICATIONS (CCC)				
Coordinate & control operations	F	NA	F	P
Provide own unit's command and control functions	F	F	F	F

TABLE 21 (cont.)

FLEET REPLENISHMENT SHIPS
REQUIRED OPERATIONAL CAPABILITIES
SYNOPSIS

MISSION AREA OPERATIONAL CAPABILITIES	AE-26		AFS-1	
	NAVY	CIVILIAN	NAVY	CIVILIAN
Provide communications	F	F/E	F	F/E
Relay naval communications	F	F/E	F	F/E
LOGISTICS (LOG)				
Conduct underway replenishment	F	F	F	F
Transfer/receive cargo and personnel	F	P	F	F
Provide sealift and airlift for cargo and personnel	F	P	F	F
Support ships and aircraft in supplies, ordnance and other services	F	F	F	F
FLEET SUPPORT OPERATIONS (FSO)				
Provide support services to other units	F	NA	F	P
Conduct towing/salvage/ rescue operations	F	F	F	F
Conduct search and rescue operations	F	F	F	F
Provide explosive ordnance disposal services	F	F/E	NA	NA
Coordinate port control functions under emergency conditions	P	P	NA	NA
Provide routine health care	F	NA	F	NA
Provide fleet training services	F	P	F	P
NONCOMBAT (NCO)				
Provide administration support for own unit	F	F	F	F

TABLE 21 (cont.)

FLEET REPLENISHMENT SHIPS
REQUIRED OPERATIONAL CAPABILITIES
SYNOPSIS

MISSION AREA / OPERATIONAL CAPABILITIES	AE-26		AFS-1	
	NAVY	CIVILIAN	NAVY	CIVILIAN
Provide upkeep and maintenance of own unit	F	F	F	F
Conduct meteorological/ hydrographic and/or oceanographic collection operations	P	P	P	P
Provide nuclear weapon readiness for ships/ squadron's weapon systems	F	F/E	NA	NA
Provide special technical research	F	NA	F	NA
Provide emergency/disaster assistance	P	P	P	P

TABLE 22
SUMMARIZED POE REQUIREMENTS

FUNCTION*	AE-26*** NAVY MILITARY	AE-26*** CIVILIAN	AFS-1 NAVY MILITARY	AFS-1 CIVILIAN
No. CONREP Stations to be manned**	6	5	5	5
No. VERTREP Stations to be manned	1	1	1	1
TOTALS	7	6	6	6

* For periods normally not to exceed 32 hours per week.

** Does not include one ancillary station serving either the starboard or portside for transfer of light, freight, passengers, mail, etc. (AE-26 class only.)

*** AE-26 Navy military manned based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

Navy planners assign the AE and AFS shuttle ship roles, connecting the multi-product station ships (AOEs and AORs based with the task force) to forward sources of supply.[23/] An AE or AFS acting as a shuttle ship will require less than the full six simultaneous CONREP station manning to resupply task force station ships. However, the six simultaneous station transfer capabilities prescribed by the AE and AFS POE also ensure them a station capability if the need arises. The NECC manning level was established to meet this capability.

This section compares the NECC with the proposed MSC crew. The dominant consideration is the six simultaneous station requirement. The comparison of crews, shown in Tables 23 and 24, indicates two points:

- The ship handling and engine personnel are roughly equal.
- The number of unlicensed personnel provided for cargo handling is much lower in the MSC crews than in the NECC.

23/ Office of the Chief of Naval Operations, "Replenishment at Sea, NWP 14 (Revision A)," November 1979.

TABLE 23

NECC/PROPOSED MSC CREW MANNING COMPARISON

	TAE-26				TAFS-1			
	NECC		PROPOSED MSC CREW		NECC		PROPOSED MSC CREW	
Dept.	Lic.	Unlic.	Lic.	Unlic.	Lic.	Unlic.	Lic.	Unlic.
Deck	6	93	6	44	6	87	6	49
Engine	9	27	7	27	9	26	6	28
Steward		27		31		26		27
Purser/ Med.		2		3		2		2
Supply		5		3		27		7
TOTAL	15	154	13	108	15	168	12	113

TABLE 24

COMPARISON OF CARGO HANDLERS
NECC AND PROPOSED MSC CREW

	TAE-26		TAFS-1	
	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
Able Seamen (Non-watch)	30	24	28	30
Ordinary Seamen (Non-watch)	45	3	41	3
TOTAL	75	27	69	33

The number of cargo handlers was addressed with the following two measures:

- The number of men per station when the ship operates six stations simultaneously.
- The number of stations the proposed MSC crew can operate while using the number of men per station in the NECC.

The following two subsections present the analysis of these measures for each UNREP ship.

a. TAE-26 POE Analysis

Table 25 shows the number of UNREP positions in the Navy military SMD, NECC, and proposed MSC crews in Readiness Condition UR. For the Navy military crew and NECC, the positions were established by the respective watch and station bills. The proposed MSC crew UNREP positions were estimated in this analysis, since MSC did not provide a watch and station bill. This estimate is considered valid since there are no major differences from the NECC in the remainder of the proposed MSC crew.

TABLE 25

TAE-26 UNREP POSITION MANNING

	NAVY MILITARY (SMD)*	NECC	PROPOSED MSC CREW
SHIP CONTROL	20	11	11
OPERATIONS CONTROL	6	0	0
COMMUNICATION CONTROL	13	MILDET	MILDET
REPLENISHMENT CONTROL (5 CONREP, 1 VERTREP)	150	120	85
ENGINEERING CONTROL	22	11	11
TOTAL POSITIONS	211	142	107

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

As demonstrated in Table 26, the majority of the Replenishment Control Group positions are in the teams that break out, package, stage, and transfer cargo.

TABLE 26

TAE-26 REPLENISHMENT CONTROL POSITION COMPARISON

	NAVY MILITARY SMD BILLETS*	NECC BILLETS	FROM NAVY MILITARY	PROPOSED MSC CREW BILLETS (ESTIMATED)	FROM NAVY MILITARY
CARGO RIG TEAMS	60	50	10	50	10
HOLD TEAMS	28	28	0	0	28
STAGING TEAMS	11	11	0	11	0
VERTREP TEAM	20	15	5	11	9
LINE GUN TEAMS	5	0	5	0	5
BRIDGE AREA	7	3	4	3	4
CARGO CONTROL	10	5	5	2	8
REPAIR PARTY	6	6	0	6	0
MEDICAL PARTY	3	2	1	2	1
TOTAL	150	120	30	85	65

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

Table 27 is a summary of all Replenishment Control Group teams engaged in actual cargo handling operations. The position/station ratio, shown in Table 27, is a measure of the crew capability in high tempo cargo handling operations.

According to MSC planners, the six simultaneous station requirement will be met in part by using Military Detachment ordnance personnel as the Hold Teams, and by pre-staging ammunition prior to replenishment operations.

TABLE 27

TAE-26

COMPARATIVE SUMMARY
CARGO HANDLING TEAMS

	NAVY MILITARY SMD*	NECC	PROPOSED MSC CREW (ESTIMATED)
CARGO RIG TEAMS	60	50	50
HOLD TEAMS	28	28	0
STAGING TEAMS	11	11	11
VERTREP TEAMS	20	15	11
TOTAL POSITIONS	119	104	72
STATIONS MANNED	6	6	6
POSITION/STATION RATIO	19.8	17.3	12

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

However, there are risks in pre-staging hazardous cargo outside of protected spaces, especially during bad weather or high sea states.

As a result of the above analysis, it is concluded that the proposed MSC crew is more realistically programmed for a four-station simultaneous transfer capability if the MSC crew operates at the NECC 17.3 position/station ratio.

b. TAFS-1 POE Analysis

The method used for the TAFS-1 class POE analysis was the same as that used for the TAE-26 class.

Table 28 shows the Navy SMD Condition UR manning for the TAFS-1 with the Navy military SMD, the NECC, and the proposed MSC crew. Again, the proposed MSC crew UNREP positions were estimated by the study group, since MSC did not provide a watch and station bill. The similarity of the NECC and proposed MSC crews in all but cargo handlers provides high confidence in the estimate.

TABLE 28

AFS-1 UNREP POSITION MANNING

	MILITARY NAVY (SMD)	NECC	PROPOSED MSC CREW (ESTIMATED)
SHIP CONTROL	18	11	11
OPERATIONS CONTROL	5	0	0
COMMUNICATION CONTROL	11	MILDET	MILDET
REPLENISHMENT CONTROL (5 CONREP, 1 VERTREP)	148	122	87
ENGINEERING CONTROL	17	11	11
TOTAL POSITIONS	199	144	109

Table 29 is the further breakdown of the Replenishment Control Group, showing that the majority of the positions are in the breakout, package, and transfer teams.

TABLE 29

TAFS-1 REPLENISHMENT CONTROL
POSITION COMPARISON

	NAVY MILITARY SMD BILLETS	NECC BILLETS	FROM NAVY MILITARY	PROPOSED MSC CREW BILLETS (ESTIMATED)	FROM NAVY MILITARY
CARGO RIG TEAMS	55	45	10	45	10
HOLD TEAMS	27	27	0	0	27
STAGING TEAMS	8	8	0	8	0
VERTREP TEAM	30	25	5	17	13
LINE GUN TEAMS	5	0	5	0	5
BRIDGE AREA	7	4	3	4	3
CARGO CONTROL	7	6	1	5	2
REPAIR PARTY	6	6	0	6	0
MEDICAL PARTY	3	2	1	2	1
TOTAL POSITIONS	148	123	25	87	61

Table 30 further allocates manpower to cargo handling stations, and indicates that MSC manning for a six-station simultaneous capability requires an assist from the Military Detachment supply personnel. Without such assistance, MSC crewing is limited to four-station simultaneous operation if they operate at the NECC 17.5 position/station ratio.

TABLE 30

TAFS-1
COMPARATIVE SUMMARY
CARGO HANDLING TEAMS

	NAVY MILITARY SMD	NECC	PROPOSED MSC CREW (ESTIMATED)
CARGO RIG TEAMS	55	45	45
HOLD TEAMS	27	27	0
STAGING TEAMS	8	8	8
VERTREP TEAMS	30	25	17
TOTAL POSITIONS	120	105	70
STATIONS MANNED	6	6	6
POSITION/STATION RATIO	20.0	17.5	11.7

As in the TAE, MSC planners advise that cargo breakout and prestaging are planned to expedite UNREP operations. However, prestaging cargo can cause hazardous conditions during bad weather and high sea states. In addition, prestaging may greatly complicate the process of responding to late changes in customer ship requirements with respect to product mix or receiving stations.

3. Endurance Factors

Navy review of CIVMAN raised the issue of the endurance of smaller civilian crews aboard UNREP ships during periods of high tempo operations.24/ Table 31 is a comparison of the Navy Military, NECC, and MSC manning levels, which shows that Navy military manning of the AE-26 and AFS-1 is significantly higher than either civilian crew. A large part of the Navy military

TABLE 31

SUMMARY COMPARISON OF MANNING LEVELS

	AE-26*			AFS-1		
GRADE	NAVY	NECC	MSC	NAVY	NECC	MSC
OFFICER	18	15	13	23	15	12
ENL/UNLIC.	374	154	108	412	168	113
TOTALS	392	169	121	435	183	125

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

crew consists of billets for purely military, administrative, and maintenance functions.

It must be assumed that at least some of the less specialized UNREP/VERTREP positions can be filled with relief crewman when

24/ Office of the Chief of Naval Operations, "Investigation of Potential for Increased Use of Civilian Manning in Fleet Support Ships (CIVMAN)," Vol. III, Ser 96/S 590196 March 21, 1978, pp. i-ii.

the operating tempo is high. To the extent that this is feasible, the larger Navy military crew has greater endurance than the civilian crew. The crewmen per UNREP position ratio (the total crew size divided by the total number of UNREP positions in Condition UR) provides an indication of manpower endurance. This ratio is shown in Table 32.

TABLE 32

UNREP POSITION
CREW/UNREP POSITION COMPARISON

	AE-26*			AFS-1		
GRADE	NAVY	NECC	MSC	NAVY	NECC	MSC
CREW SIZE	392	169	121	435	183	125
UNREP POSITIONS (COND. UR)	211	142	107	199	144	109
CREW/UNREP POSITION RATIO	1.9	1.2	1.1	2.2	1.3	1.2

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

The crewmen/UNREP position ratio may overstate endurance for the Navy military crew. Sailors involved in such vital services such as food preparation are not available for UNREP duties. Another group of Ship and Engine Control personnel must be rested (minimum of eight hours) to relieve other watchstanders during and after replenishment operations. However, Navy military crews appear to have more flexibility in around-the-clock or contingency type operations than civilian crews.

B. DESTROYER TENDER

1. Feasibility of Civilian Operation

This subsection is an analysis of the feasibility of operating the AD-37 with a civilian crew.

The analysis assumed the wartime logistics and fleet support operations capabilities would be maintained and that the repair and weapon repair shop capabilities and capacities would be as indicated in the SMD. This assumption results in the need to berth the Repair Department either offship or in the existing military quarters, because CNO policy requires military personnel to have accommodations similar to civilian. Provision of equal accommodations is impossible without reducing shop space. It was further assumed that even if the civilian repair crew was billeted off the ship, the military quarters would be maintained intact in order to provide temporary accommodations to a civilian repair crew in the event of redeployment to remote locations.

There is a question of the feasibility of modifying the AD-37 for civilian manning. Both MSC and independent Naval architect, M. Rosenblatt and Son, Inc., were requested to estimate the feasibility and cost involved in the modification of the AD-37's operating crew accommodations to ensure that they meet civilian habitation standards. MSC's response is shown in Appendix J.[25/] M. Rosenblat & Son, Inc., developed a modification plan and cost estimate for this ship to provide civilian accommodations for the operating crew.[26/] The Rosenblatt study was submitted to MSC for informal comment. MSC advised that there were major differences in the assumptions on which the two estimates were based. MSC's estimate appears to be based on a conversion, while the Rosenblatt estimate appears to be a minimum cost modification.

2. ROC/POE Review

The ROC is summarized in Table 33.[27/] This analysis developed a Notional ROC for a civilian crew which eliminated the purely military functions, such as anti-air and anti-surface warfare. The results are presented in Table 33.

25/ See Appendix J.

26/ M. Rosenblatt & Son, Inc., AD-37 Conversion, May 5, 1982. See Appendix E.

27/ OPNAVINST 3501.140, January 23, 1981.

TABLE 33
REQUIRED OPERATIONAL CAPABILITIES
DESTROYER TENDER, AD-37

Legend
F-Full Capability
P-Partial Capability
D-Depot Level Maintenance
E-Performed by Navy MILDET
N/A-Not Applicable

ITIES	NAVY	MSC/NECC
ion	F	F
localize ship targets	F	P
	P	P
argo and personnel	P	P
r cargo	P	P
capability	F	F
damage	F	F
n	F	F
and navigation tasks	F	F
	P	P
well being of crew	F	F
control organization	F	N/A
ol of task organization	F	N/A
ommand and control	F	F

TABLE 33 (Cont'd)
REQUIRED OPERATIONAL CAPABILITIES
DESTROYER TENDER, AD-37

MISSION AREAS OPERATIONAL CAPABILITIES	NAVY	MSC/NECC
Provide communications	F	F/E
Relay communications	F	F/E
NON-COMBAT OPERATIONS		
Provide administration and supply support for own unit	F	F
Provide upkeep and maintenance of own unit	F	F
Conduct meteorological, hydrographic, and/or oceanographic collection operations	P	P
Provide nuclear weapons readiness for ship's/squadron weapons systems	F	F/E
Provide emergency/disaster assistance	F	F/E
FLEET SUPPORT OPERATIONS		
Repair and overhaul ships and associated equipment	F	F
Provide support services to other units	F	F
Conduct search and rescue operations	F	F
Provide routine health care	F	F/E
Provide first aid assistance	F	F/E
Provide definitive dental care	F	F/E
Provide fleet training services	F/P	F/P

The POE statement [28], which gives general wartime requirements for the AD-37 class destroyer tender, can be summarized as follows:

- Provide full repair and logistic support in wartime to ships assigned for availability in CONUS, at an advanced base, at anchor, or moored to a pier.
- Support an embarked cruiser-destroyer group commander and staff.
- Support the equivalent of six DD-963 class destroyers alongside simultaneously.
- Perform all maintenance for which ship's company is assigned responsibility.

The Rosenblatt study concluded that the flag quarters on the 02 level must be converted to civilian quarters to meet the MSC Habitability Requirements. This results in a loss in capability.

28/ OPNAVINST 3501.140, January 23, 1981.

IV. OPERATIONAL ANALYSIS

This section addresses the question of availability for UNREP duty at sea for both Navy military and civilian manned ships. Notional Operation Schedules were constructed and used to calculate the time available for UNREP duty at sea for each type of manning. The results were compared to the actual time at sea spent by the Navy military manned AE-26 and AFS-1 class ships.

For the tender, the days in port were compared to days in port for both permanently deployed and rotating AS type ships.

A. UNDERWAY REPLENISHMENT (UNREP) SHIPS

1. Background

The scheduling philosophies for the Navy manned and the civilian manned ship differ significantly. The normal operating cycle of the Navy military manned ship is built around phased maintenance and overseas deployment schedules: all ships of a class share time overseas equally in order that each ship can spend approximately equal time in the CONUS portions of their operating cycles. This allows crewmen maximum time operating from homeport which helps Navy military retention by reducing family separation. Civilian manned ships are forward deployed without homeport constraints for as long as two years between major overhaul cycles.

2. Notional Schedule Development

The analysis consisted of the development of a notional three year schedule on a weekly basis for both UNREP ships when civilian and military manned. These schedules are shown and summarized in Appendix F. Each schedule begins with the ship in regular overhaul. The schedules for the civilian manned ships were prepared to reflect the policies and practices of the Military Sealift Command. Maintenance and deployment patterns are the same as those that were followed in the operation of Navy civil service crewed AOs.

The schedules were developed over equal time periods rather than over regular overhaul cycles because maintenance concepts change from time to time and actual schedules vary from ship to ship. Since neither UNREP ship is presently operated by MSC, no operational data exists for the civilian manned option.

3. Schedule Analysis

This analysis constructed three measures from the Notional Schedules: maintenance downtime, time available for UNREP duty at sea, and maximum days at sea per year.

Maintenance downtime is the fraction of a year in which the ship is unavialable because of scheduled maintenance.

- For a military manned ship, scheduled maintenance downtime consists of a regular overhaul, restricted availability, tender availability, ready for sea period, and refresher training.
- For a civilian manned ship, scheduled maintenance downtime consists of regular overhaul, mid-term inspection, voyage repairs, and the ready for sea period.

4. Results

For the AE-26, maintenance downtime, UNREP availability time, and maximum days at sea per year as reflected in the Notional Schedules[29] are presented in Table 34. The results presented indicate that maintenance downtime is 2 to 2.5 times longer ona military manned ship as the downtime on a civilian manned ship.

29/ See Appendix F.

TABLE 34
OPERATIONAL ANALYSIS
SUMMARY

Ship Type	Maintenance Down-Time (%)	Time Available for UNREP Duty at Sea (%)	Max Days at Sea Per Year
AE	43	29	108
TAE	17	53	192

The analysis shows that a civilian manned UNREP ship is available for peacetime UNREP duty at sea a greater amount of time than the same ship when Navy military manned.

When a given UNREP force level consists of both civilian and Navy military manned ships, it is necessary to know the relationship of days at sea to days available for both types of manning. Since neither UNREP ship in this study has been civilian manned, there is no data with which to determine actual days at sea. Therefore, this study assumed that the days at sea are equal for both ships regardless of manning option. This further assumes a fixed force level and constant fleet demand. The cost calculations in Section V reflect these assumptions and are presented as a baseline. For other force levels and mixes of civilian and Navy military manned ships, cost based on days at sea will differ.

B. DESTROYER TENDERS

Destroyer tenders are designated by the POE statement to operate from CONUS and advanced bases. In wartime, destroyer tenders are deployed to areas where their services are available to a highly mobile combatant fleet, and where facilities ashore are non-existent or not available.

In peacetime, a destroyer tender is rotated between CONUS and overseas theaters where combatant forces are deployed. The FY78-80

Navy Energy Usage Profile Analysis[30/] showed that AD type ships had 334 days in port during which time they were available to provide maintenance.

However, submarine tenders (AS) for ballistic missile submarines have been homeported overseas for several years: home porting is used whewhenever it alleviates scheduling problems. However, tenders serving attack submarines have been rotated. The FY 78-80 Navy Energy Usage Profile Analyses indicates that overseas deployed AS type ships spent 346 days in port compared to 336 for AS type ships that are rotated. This indicates that about 10 extra days per year were available for maintenance when permanent overseas homeporting is used. The difference in days in port per year is due to the transit time.

Table 35 shows the probable peacetime deployment locations of the AD-37. The deployment locations would probably be the same if the ship were civilian manned. Also shown in Table 35 is the type of accommodations in these locations.

TABLE 35

AD-37 TYPICAL PEACETIME DEPLOYMENT LOCATIONS
AVAILABILITY AND TYPE OF HOUSING

Locations	Availability of Housing/ Type of Housing
Naples, Italy	Available/Commercial
Rota, Spain	Available/Substandard Military
Subic Bay, Philippines	Available/Substandard Military
Yokosuka, Japan	Available/Commercial
Diego Garcia	None

30/ David W. Taylor Naval Ship Research and Development Center, Annapolis, MD. Navy Energy Usage Profile Analysis, FY 78, FY 79, FY 80 editions.

V. COST ANALYSIS

A. UNDERWAY REPLENISHMENT (UNREP) SHIPS

I. Introduction

A comprehensive cost analysis was conducted for each manning option: Navy military, Navy civil service, and commercial contract. The cost measures used were: Five-Year Defense Plan (FYDP) profile, economic cost to the DOD, and economic cost to the U.S. Government. The cost analysis is consistent with the rules published for POM 84. The FYDP cost was measured in escalated, or current year, dollars: this is the sum of the FY 84 projected cost to the Navy in FY 84 dollars, the FY 85 projected cost to the Navy in FY 85 dollars. The economic cost was measured in constant FY 82 dollars.

The FYDP cost shows the impact on the Total Obligational Authority (TOA) from the Manpower, Navy (MPN), Operations and Maintenance, Navy (OMN), and Other Procurement, Navy (OPN) accounts that would result from converting a Navy military manned AE-26 and AFS-1 class ship to civilian manning over the FY 84 through 88 time frame. The economic cost measures show the total resource cost of each ship operated under each manning option. Economic costs are quite different from the Navy budget costs detailed in the FYDP section, since economic costs include accrued and deferred costs (such as "downtime" and retirement costs) to the U.S. Government. Economic cost to the government includes the lost tax revenue associated with the non-taxable allowances to military personnel. Economic cost to DOD does not include the foregone tax.

FYDP cost estimates expenditures in the FY 84 through 88 period while the economic cost estimates an average annual cost with items such as regular overhaul annualized over the maintenance cycle and civilian modification costs prorated over the remaining life of the ship.

2. Navy Military Cost

a. Manpower FYDP Cost

The Navy military manpower cost was estimated by applying the Composite Standard Military Rates (CSMR) to the billets tabulated by paygrade in the Ship Manpower Document (SMD). The CSMR Table is contained in NAVCOMPTNOTE 7041 (Change 1) and was effective 4 February 1982. The CIVMAN study investigated several methods to estimate military manpower FYDP costs on auxiliary ships and found that the CSMR method most closely reflected the real manpower cost to the Navy.[31] In addition, the CSMR method shows the cost at the individual crew member level. This visibility is needed for trade-off and sensitivity analysis purposes.

The CSMR consists of:

Base Pay	Hazardous Duty Pay
Foreign Duty Pay	FICA (Employer's Share)
Family Separation Allowance	Clothing Allowance
Subsistence Allowance	Re-enlistment Bonuses
Separation Payments	Death Gratuity
Settlement Costs	BAQ
Life Insurance	Proficiency Pay
Sea Pay	PCS

Indirect MPN costs, which are estimated as 39% of the direct MPN costs, are added to the total CSMR to obtain the total MPN cost. Indirect MPN consists of:

Base Operating Support	Recruiting and Examining Activities
Training	Transients
Health Activities	Personnel Holding Account

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[31]/Office of the Chief of Naval Operations, "Investigation of the Potential for Increased Use of Civilian Manning on Fleet Support Ships (CIVMAN)," Vol. III, Ser 96/S 590196, March 21, 1978, pp. B-4 - B-6.

This indirect MPN factor was derived from the November 1980 Navy Program Factors Manual (NARM).[32/] The total direct and indirect MPN costs for Navy military manning are shown in Table 36. Detailed calculations are shown in Appendix G.

TABLE 36

TOTAL DIRECT
AND INDIRECT MANPOWER FYDP COST
NAVY MILITARY MANNING
(FY 82 $K)

SHIP CLASS	FULL SMD CAPABILITY	OPERATIONAL NAVY MANNING*
AE-26**	8,982	7,635
AFS-1	10,210	8,678

*Assumed to be 85% SMD Manning.

**AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

b. Operations and Maintenance FYDP Cost

The Navy military operations and maintenance cost fall into two appropriations: OMN and OPN. The OPN category consists of the Fleet Modernization Program (FMP) procurement. The OMN category consists of:

- Temporary Additional Duty (TAD)
- Petroleum, Oil and Lubricants (POL)
- Repair Parts
- Supplies
- Training Expendable Stores
- Purchased Services
- Direct Intermediate Maintenance
- Regular Overhaul (ROH)
- Selected Restricted Availability (SRA)
- Restricted Availability/ Technical Availability (RA/TA)
- FMP (Installation and Overhead)
- Other Depot Costs
- Direct Recurring Investment
- Indirect OMN
- Indirect Logistics

32/ Office of the Chief of Naval Operations (OPNV-90P-02-D), Navy Program Factors Manual (U), Ser 901 M/587803, November 18, 1980.

All of these costs elements, except Indirect OMN and Indirect Logistics, were derived in constant FY 82 dollars from the FY 80 edition of the Visibility and Management of Operating and Support Costs-Ships: Total Support System (VAMOSC-Ships: TSS) data base.[33] This data is presented in Table 37. The FY 80 VAMOSC data was used because it incorporates more complete reports of depot costs than earlier editions of VAMOSC. The escalators were derived from the "Escalation Indices and Outlay Profile Factors" (May 1982) prepared by OP-96D.[34] The total cost of an ROH was derived from the average annual ROH cost through the following formula:

Total ROH Cost = Average Annual ROH Costs x (ROH Interval + ROH Duration)

The AFS-1 class ships undergo a 3 month phased maintenance period every 12 months in the Atlantic and every 15 months in the Pacific. These figures were averaged to a 13 month "interval" and a 3 month "duration". The November 1980 Navy Program Factors Manual states that the AE-26 class ships undergo a 10 month overhaul every 48 months.

Indirect OMN consists of:

Base Operating Support	Health Activities
Training	Recruiting and Examining Activities

The indirect OMN and Logistics costs were estimated as 9% of direct MPN costs and 13% of the direct OMN costs respectively based on the ratio used in the November 1980 NARM.[35]

33/ Naval Sea Systems Command (SEA-04F2), "Visibility and Management of Operating and Support Costs-Ships: Total Support System," FY 1980

34/ Office of the Chief of Naval Operations (OP-96D, "Escalation Indices and Outlay Profile Factors," May 1982.

35/ Office of the Chief of Naval Operations (OP-90P-02-D), Navy Program Factors Manual (U), Ser 901 M/587803, November 18, 1980.

TABLE 37

ANNUAL OPERATIONS AND MAINTENANCE
FYDP COST DATA
NAVY MILITARY MANNING
(FY 82 $)

Cost Element	AE-26	AFS-1
Temporary Additional Duty (TAD)	15,180	14,469
Ship POL	3,896,019	3,136,254
Repair Parts	258,226	406,177
Supplies	286,004	381,484
Training Expendable Stores	28,866	26,604
Purchased Services	201,929	276,040
Direct Intermediate Maintenance	76,622	136,421
Regular Overhaul	2,141,490	5,350,018
RA/TA/SRA	1,310,294	1,471,421
FMP (OMN Funded)	55,307	794,500
FMP (OPN Funded)	113,072	106,615
Other Depot Costs	104,496	30,787
Direct Recurring Investment	347,597	877,857

c. FYDP Profile

The FYDP cost profiles for full SMD manning are shown in Table 38, while Table 39 shows the FYDP profile for 85% SMD manning. Each ship was assumed to begin ROH at the beginning of FY 84 for analytical purposes. The annual costs were then escalated by factors consistent with POM 84-7/Change 2 to derive the TOA estimates.[36] MPN is unescalated in accordance with POM guidance.

[36] Office of the Chief of Naval Operations, "Pricing and Cost Escalation Guidance (POM 84-7)," Change 2, February 2, 1982.

TABLE 38

FYDP PROFILE-FULL SMD MANNING
NAVY MILITARY MANNING
(FYDP $K) (FY 84 - FY 88)

AE-26*

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	8,982	8,982	8,982	8,982	8,982	44,910
OMN	14,624	9,089	9,537	10,018	10,497	53,765
OPN	124	130	136	142	148	680
TOTAL	23,730	18,201	18,655	19,142	19,627	99,355

AFS-1

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	10,210	10,210	10,210	10,210	10,210	51,050
OMN	16,401	17,132	17,891	11,430	19,526	82,380
OPN	118	123	128	134	140	643
TOTAL	26,729	27,465	28,229	21,774	29,876	134,073

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

TABLE 39

FYDP PROFILE-85% SMD MANNING
NAVY MILITARY MANNING
(FYDP $K) (FY 84 - FY 88)

AE-26*

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	7,635	7,635	7,635	7,635	7,635	38,175
OMN	14,529	8,989	9,433	9,910	10,385	53,246
OPN	124	130	136	142	148	680
TOTAL	22,288	16,754	17,204	17,687	18,168	92,101

AFS-1

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	8,678	8,678	8,678	8,678	8,678	43,390
OMN	16,293	17,020	17,775	11,307	19,399	81,794
OPN	118	123	128	134	140	643
TOTAL	25,089	25,821	26,581	20,119	28,217	125,827

* AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

d. Manpower Economic Cost

Navy military manpower economic costs were developed from the FY 81 edition of the Navy Billet Cost Model (NBCM). This model estimates the annualized life cycle cost incurred by DOD to man a particular billet. The NBCM computes the cost for each rate and rating for both officer and enlisted Naval personnel.

The officer cost inputs are:37/

Base Pay
Command and Administration
Death Gratuity
Dependent School
Family Separation Allowance
Hazard Pay
Medical Costs
Messing Subsistence
Prisoner Apprehension
Quarters Allowance
Retirement
Severance/Readjustment Pay
Clothing Allowance
Commissary
Dental Pay
Disability
FICA
Insurance/Housing (FHA)
Medical/Veteranarian Pay
Overseas Station Allowance
Personnel Procurement
Incentive/Continuance Pay
School Training
Travel/Transportation

The enlisted cost inputs are:38/

Base Pay
Command and Administration
Death Gratuity
Disability
FICA
Insurance/Housing FHA
Messing Subsistence
Prisoner Apprehension
Pro-Pay
Recreation Facilities
Re-enlistment Bonus
School Cost
Severance
Clothing Allowance
Commissary
Dependent School
Family Separation Allowance
Hazard Pay
Medical Costs
Overseas Station Allowance
Procurement Personnel
Quarters Allowance
Recruiting Costs
Retirement
Sea and Foreign Duty Pay
Travel

The total cost in FY 81 dollars was escalated to FY 82 dollars by using the total MPN escalator from the "Escalation

37/Navy Personnel Research and Development Center, Life Cycle Navy Officer Billet Costs - FY 1981, NPRDC TR 81-12, June 1981.

38/Navy Personnel Research and Development Center, Life Cycle Navy Enlisted Billet Costs - FY 1981, NPRDC SR 81-22, July 1981.

Indices and Outlay Profile Factors" (May 1982) prepared by OP-96D.[39] These estimates are presented in Table 40. Detailed calculations are presented in Appendix H.

TABLE 40

MANPOWER ECONOMIC COST TO DOD
NAVY MILITARY MANNING
(FY 82 $K)

SHIP CLASS	FULL SMD CAPABILITY	OPERATIONAL* NAVY MANNING
AE**	7,502	6,376
AFS	8,502	7,226

* Assumed to be 85% SMD Manning.

** AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

To determine the economic cost to the U.S. Government, the foregone taxes on nontaxable allowances for military personnel were added to the manpower economic cost to DOD. The manpower economic cost to the Government is shown in Table 41.

TABLE 41

MANPOWER ECONOMIC COST TO U.S. GOVERNMENT
NAVY MILITARY MANNING
(FY 82 $K)

SHIP CLASS	FULL SMD CAPABILITY	OPERATIONAL* NAVY MANNING
AE**	7,873	6,692
AFS	8,925	7,586

* Assumed to be 85% SMD Manning.

** AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

[39] Office of the Chief of Naval Operations (OP-96D), "Escalation Indices and Outlay Profile Factors," May 1982.

The method used to estimate foregone tax was based on the CIVMAN methodology.[40] Foregone taxes were estimated by determining for each enlisted and officer pay grade, from the current Federal Withholding Tax tables, the tax rate applicable to the composite rate for that grade. The tax rate established for each pay grade was applied to the allowances portion of the composite cost for that pay grade. The resultant foregone taxes by pay grade were then weighted by the number of personnel of each pay grade on each ship. The tax rates were established by following the BUPERS suggested assumptions from CIVMAN. All personnel were assumed to be married. Officers had 3 exemptions; enlisted personnel had 2 exemptions. The foregone taxes used are shown in Table 42.

TABLE 42

FOREGONE TAX ON
ALLOWANCES
TO MILITARY PERSONNEL
(FY 82 $)

DAY GRADE	FOREGONE TAX
0-6	3,484
0-5	3,229
0-4	2,617
0-3	2,041
0-2	1,644
0-1	1,067
W-4	2,544
W-3	2,004
W-2	1,625
E-9	2,131
E-8	1,775
E-7	1,459
E-6	1,217
E-5	1,155
E-4	923
E-3	720

[40] Office of the Chief of Naval Operations, "Investigation of the Potential for Increased Use of Civilian Manning on Fleet Support Ships (CIVMAN)," Vol. III, Ser 96/S 590196, March 21, 1978, p. B-81.

e. Operations and Maintenance Economic Cost

The operations and maintenance economic cost element breakdown structure and estimates are shown in Table 43. The economic cost measure is an annual operations and maintenance cost. Regular overhaul is estimated as an average annual cost.

TABLE 43

OPERATIONS AND MAINTENANCE
ECONOMIC COST TO DOD
NAVY MILITARY MANNING
(FY 82 $)

Cost Element	AE-26	AFS-1
Indirect Logistics (13% Direct OMN)*	$1,131,891	$1,675,383
Ship POL	3,896,019	3,136,254
Repair Parts	258,226	406,177
Supplies	286,004	381,484
Training Expendable Stores	28,866	26,604
Purchased Services	201,929	276,040
Direct Intermediate Maintenance	76,622	136,421
Regular Overhaul	2,141,490	5,350,018
RA/TA/SRA	1,310,294	1,471,421
FMP (OMN Funded)	55,307	794,500
FMP (OPN Funded)	113,072	106,615
Other Depot Costs	104,496	30,787
Direct Recurring Investment	347,597	877,857
Total Operations and Maintenance Economic Cost	9,951,813	14,669,561

*Direct OMN is $8,706,850 for the AE and $12,887,563 for the AFS.

Indirect Logistics cost is estimated because the MSC Overhead cost includes these costs per CIVMAN, Vol. III, pp. B-80, B-83.

f. Total Economic Cost

The total economic cost to DOD is shown in Table 44. The total economic cost to the U.S. Government is shown in Table 45.

TABLE 44

ANNUAL ECONOMIC OPERATING COST TO DOD
NAVY MILITARY MANNING
(FY 82 $K)

SHIP CLASS	FULL SMD CAPABILITY	OPERATIONAL* NAVY MANNING
AE**	17,454	16,328
AFS	23,171	21,896

* Assumed to be 85% SMD Manning.

**AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

TABLE 45

ANNUAL ECONOMIC OPERATING COST TO U.S. GOVERNMENT
NAVY MILITARY MANNING
(FY 82 $K)

SHIP CLASS	FULL SMD CAPABILITY	OPERATIONAL* NAVY MANNING
AE**	17,825	16,644
AFS	23,595	22,256

* Assumed to be 85% SMD Manning.

**AE-26 Navy military manning based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE.

3. Navy Civil Service Cost

a. Manpower FYDP Cost

The manpower FYDP Cost is the funding necessary to man both the Notional Equal Capability Crew (NECC) and the proposed MSC crew outlined in Section II with Civil Service and Military Detachment personnel. The Navy civil service manpower cost (which is funded with OMN dollars) consists of the following elements:

- Base Pay
- Overtime
- Premium/Penalty Pay
- Subsistence
- Other
  - Relief Officers, Awaiting Assignment, Training, Damage Control Instruction
- Retirement
- Life and Health Insurance
- Workman's Compensation, Bonuses and Awards, & Unemployment Programs
- Shore Leave
- Annual, Sick and Military Leave
- Travel
- Ammunition Bonus

Overtime, premium/penalty pay, travel, and other costs were estimated for this report using the same methodology as was used in the CIVMAN study computations. The remaining costs reflect current MSC accounting rules and are detailed in Table 46. Base pay figures were obtained from 2 February 1982 Revision of the Atlantic and Pacific Schedule of Wages for MSC Mariners (COMSC M-21).41/ In the unlicensed billets, Atlantic wages were used. Detailed calculations are shown in Appendix I.

MSC manpower costs were not escalated since the latest POM guidance indicates the General Schedule and Wage Board employee salaries under OMN are not to be escalated.42/ This is analytically consistent with no increase for Navy military manpower cost.

41/Commander, Military Sealift Command (M-021), "Revision of the Atlantic and Pacific Schedule of Wages for MSC Mariners," February 2, 1982.

42/Office of the Chief of Naval Operations, "Pricing and Cost Escalation Guidance (POM 84-7)," Change 2, February 2, 1982.

The military detachment costs (which are funded by MPN) were estimated in the same manner as the Navy military manpower cost reported in subsection 2.a.

Table 47 displays the civilian crew and military detachment costs for the Navy civil service option.

b. Operations and Maintenance FYDP Cost

The Navy civil service operations, maintenance, and repair cost elements are:

- One Time Costs - Repair, Overhaul, Drydock, Regulatory Inspection, Maintenance, Habitability Modifications, and Support Systems.
- Recurring Costs - Overhaul, Mid-period Repairs, Voyage Repairs, Alterations, Extraordinary Repairs, and Accident and Damage Repairs.
- Operation Costs - Supplies, Fuel, and Indirect OMN.

The maintenance and repair costs (listed above as one time costs and recurring costs) were estimated by the MSC Engineering Office and were based on the following assumptions for the AE and AFS:

- Material conditions good to excellent as found on the KILAUEA.
- Material upgrade of UNREP equipment costs are not part of the study, but costs to be incurred under either operational scenario.[43]

Since the number of people in the NECC differs from the proposed MSC manning, MSC prepared an estimate of conversion cost for each crew recognizing that the NECC would require more space and therefore a higher cost. MSC further states that:

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[43]Commander, Military Sealift Command, M-4EX, 4700, Ser 2046, May 17, 1982.

TABLE 46

NAVY CIVIL SERVICE MANPOWER COST FACTORS
(PERCENT BASE PAY)

COST ELEMENT	% BASE PAY	BASIS
Overtime	37% (AE) 55% (AFS)	CIVMAN CIVMAN
Premium/Penalty Pay	7%	CIVMAN
Other: (Relief Officers Awaiting Assignment Training Damage Control Instruction)	6%	CIVMAN
Retirement	7% in FYDP Cost 20.4% in Economic Cost	MSC Method OMB A-76
Life & Health Insurance	3.7%	OMB A-76
Workman's Compensation, Bonuses & Awards, and Unemployment Programs	1.9%	OMB A-76
Shore Leave	10.5%	MSC Method
Annual, Sick, and Military Leave	20%	CIVMAN
Travel	2%	CIVMAN
Ammunition Bonus (AE Only) (Paid to all personnel serving aboard a ship carrying at least 50 tons of ammunition)	10%	CIVMAN

TABLE 47

TOTAL DIRECT AND INDIRECT MANPOWER
FYDP COST
NAVY CIVIL SERVICE MANNING
(FY 82 $K)

	NECC			PROPOSED MSC CREW		
Ship Class	Civilians	Military Detachment	Total	Civilians	Military Detachment	Total
TAE-26	6,011	825	6,836	4,571	1,042	5,613
TAFS-1	7,216	457	7,673	5,189	1,089	6,278

"The data provided is considered of study quality, however, if refined budget estimates are required, MSC will have to visit the ships and perform in-depth study of material conditions and solutions to CIVMOD problems."44/

Navy civil service operations costs were estimated by the study group. POL was taken from the VAMOSC-Ships: TSS data base and are assumed to equal the average annual POL cost for a Navy military manned ship since the operations of these ships are basically determined by fleet demand. FMP and supplies were included and assumed equal to the cost for a Navy military manned ship.

The Indirect OMN and Logistics costs were estimated in the same way as were the costs for a Navy military manned ship.

c. FYDP Profile

The MSC Engineering Office advises that it is reasonable to assume that the average time to convert a support ship to civilian manning is 9 months. The FYDP Cost is estimated using this conversion time and both the NECC and MSC proposed crew. These results are shown in Tables 48 and 49. All costs, except the military detachment, are adjusted for the 5% MSC overhead cost.

It was further assumed that no manpower costs were incurred for either a civilian or military crew while the ship is undergoing conversion.

44/Ibid.

TABLE 48

FYDP PROFILE - NECC
NAVY CIVIL SERVICE MANNING
(FYDP $K) (FY 84 - FY 88)

	TAE					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	206	825	825	825	825	3,506
OMN	28,918	16,607	18,193	17,677	19,390	100,785
OPN	124	130	136	142	148	680
TOTAL	29,248	17,562	19,154	18,644	20,363	104,971

	TAFS					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	114	457	457	457	457	1,942
OMN	30,378	16,990	18,526	17,962	19,620	103,476
OPN	118	123	128	134	140	643
TOTAL	30,610	17,570	19,111	18,553	20,217	106,061

TABLE 49

FYDP PROFILE - PROPOSED MSC CREW
NAVY CIVIL SERVICE MANNING
(FYDP $K) (FY 84 - FY 88)

	TAE					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	261	1,042	1,042	1,042	1,042	4,429
OMN	25,856	15,184	16,769	16,256	17,968	92,033
OPN	124	130	136	142	148	680
TOTAL	26,241	16,356	17,947	17,440	19,158	97,142

	TAFS					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	272	1,089	1,089	1,089	1,089	4,628
OMN	28,798	15,009	16,547	15,985	17,645	93,984
OPN	118	123	128	134	140	643
TOTAL	29,188	16,221	17,764	17,208	18,874	99,255

d. Manpower Economic Cost

The method used to compute the annual economic cost for Navy civil service personnel differs from the FYDP cost method in retirement costs. For economic cost, retirement is 20.4% of base pay (as directed by OMB Circular A-76), rather than 7%.[45/] The method used to compute Navy military detachment economic cost is the same used for the Navy military manning alternative. The results are shown in Table 50. Detailed calculations are shown in Appendix I.

TABLE 50

MANPOWER ECONOMIC COST
NAVY CIVIL SERVICE MANNING
(FY 82 $K)

Economic Cost to DOD

	NECC			PROPOSED MSC CREW		
	CIVILIANS	MILDET	TOTAL	CIVILIANS	MILDET	TOTAL
TAE	6,380	698	7,078	4,853	871	5,724
TAFS	7,646	384	8,030	5,499	871	6,370

Economic Cost to U.S. Government

	NECC			PROPOSED MSC CREW		
	CIVILIANS	MILDET	TOTAL	CIVILIANS	MILDET	TOTAL
TAE	6,380	733	7,113	4,853	915	5,768
TAFS	7,646	403	8,049	5,499	917	6,416

45/Office of Management and Budget, Circular No. A-76 (Transmittal Memorandum No. 6), "Policies for Acquiring Commercial or Industrial Type Products and Services Needed by the Government," January 26, 1982.

e. Operations and Maintenance Economic Cost

This cost is similar to the operations and maintenance FYDP cost, except for the following: first, all recurring maintenance costs were annualized over the MSC 2-year overhaul cycle. Second, the cost of civilian modification is annualized over the remainder of the ship's life cycle, which is assumed to be 40 years in total.[46] The remaining years of service used were: 24 years for the TAE and 20 years for the TAFS. The costs are shown in Tables 51 and 52.

f. Total Economic Cost

The total economic cost to DOD and the U.S. Government are shown in Tables 51 and 52 respectively.

4. Commercial Contract Cost

a. Manpower FYDP Cost

The commercial contract manpower cost (which is part of OMN) consists of the following elements:

- Base Pay
- Non-watch Allowance
- Vacation
- Pension Fund
- Welfare/Medical Fund
- Automation Differential
- Hiring Costs
- Travel
- Pension Contribution During Paid Vacation
- Training
- Ammunition Differential
- Overtime
- Social Security Employer's Contribution

The data used to compute these costs was obtained from the U.S. Maritime Administration, Office of Maritime Labor and Training.

46/Office of the Chief of Naval Operations, "Investigation of the Potential for Increased Use of Civilian Manning on Fleet Support Ships (CIVMAN)," Vol. III, Ser 96/S 590196, March 21, 1978, p. B-79.

TABLE 51

ANNUAL ECONOMIC OPERATING COST TO DOD
NAVY CIVIL SERVICE MANNING
(FY 82 $K)

	TAE	
	NECC	PROPOSED MSC CREW
Manpower	7,078	5,724
Operations and Maintenance	10,639	10,535
Total	17,717	16,259

	TAFS	
	NECC	PROPOSED MSC CREW
Manpower	8,030	6,370
Operations and Maintenance	10,152	10,102
Total	18,182	16,472

TABLE 52

ANNUAL ECONOMIC OPERATING COST TO U.S. GOVERNMENT
NAVY CIVIL SERVICE MANNING
(FY 82 $K)

	TAE	
	NECC	PROPOSED MSC CREW
Manpower	7,113	5,768
Operations and Maintenance	10,639	10,535
Total	17,752	16,303

	TAFS	
	NECC	PROPOSED MSC CREW
Manpower	8,049	6,416
Operations and Maintenance	10,152	10,102
Total	18,201	16,518

The direct and indirect manpower costs for the Notional Equal Capability Crew (NECC) and the proposed MSC crew are shown in Table 53. Overtime and travel were estimated as the same percentage of base pay as a Navy civil service manned ship (see Table 46). No information or conclusions in the operations analysis provides a convincing reason to change these percentages. Social Security Employer's Contribution was estimated as 6.7% of total base pay, rather than the first $32,000, for two reasons. First, overtime is not allocated on an individual basis in this data, but social security is paid on overtime earnings. Second, an additional cost for state unemployment insurance exists, but no data is available with which to estimate it. These two factors reduce any overstatement from estimating social security cost as a constant fraction of total base pay.

TABLE 53

TOTAL DIRECT AND INDIRECT MANPOWER
FYDP COST
COMMERCIAL CONTRACT MANNING
(FY 82 $K)

	NECC			PROPOSED MSC CREW		
Ship Class	Civilians	Military Detachment	Total	Civilians	Military Detachment	Total
TAE-26	9,129	825	9,954	6,971	1,042	8,013
TAFS-1	10,115	457	10,572	7,284	1,089	8,373

To these costs were added personal and indemnity insurance derived from CIVMAN.[47] A 4% MSC overhead cost was applied to all costs except the military detachment as per OMB A-76: this differs from the existing MSC 5% overhead estimate for Navy civil service manning. Detailed calculations are shown in Appendix K.

[47] U.S. Maritime Administration, letter from Mr. A. W. Friedberg to Mr. I. N. Blickstein, June 1, 1977.

b. Operations and Maintenance FYDP Cost

The operations and maintenance cost estimates used in the Navy civil service option were assumed to be equally applicable to the commercial contract operations and maintenance costs as in the CIVMAN study.[48] To these costs is added the estimated agency fee derived from CIVMAN. These costs were estimated at $122,224 for each ship.[49] A 4% MSC overhead figure was applied to these costs.

c. FYDP Profile

The same assumptions used to derive the Navy civil service FYDP profile were used to derive the commercial contract FYDP profiles. These estimates are shown in Tables 54 and 55.

TABLE 54

FYDP PROFILE - NECC
COMMERCIAL CONTRACT MANNING
(FYDP $K) (FY 84 - FY 88)

	TAE					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	206	825	825	825	825	3,506
OMN	29,470	19,769	21,345	20,841	22,544	113,969
OPN	124	130	136	142	148	680
TOTAL	29,800	20,724	22,306	21,808	23,517	118,155

	TAFS					
	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	114	457	457	457	457	1,942
OMN	30,864	19,940	21,467	20,916	22,565	115,752
OPN	118	123	128	134	140	643
TOTAL	31,096	20,520	22,052	21,507	23,162	118,337

[48]/Office of the Chief of Naval Operations, "Investigation of the Potential for Increased Use of Civilian Manning on Fleet Support Ships (CIVMAN)," Vol. III, Ser 96/S 590196, March 21, 1978, pp. B-86 - 87.

[49]/U.S. Maritime Administration, letter from Mr. A. W. Friedberg to Mr. I. N. Blickstein, June 1, 1977.

TABLE 55

FYDP PROFILE - PROPOSED MSC CREW
COMMERCIAL CONTRACT MANNING
(FYDP $K) (FY 84 - FY 88)

TAE

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	261	1,042	1,042	1,042	1,042	4,429
OMN	26,255	17,627	19,203	18,700	20,404	102,189
OPN	124	130	136	142	148	680
TOTAL	26,640	18,799	20,381	19,884	21,594	107,298

TAFS

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	272	1,089	1,089	1,089	1,089	4,628
OMN	29,096	17,154	18,684	18,133	19,786	102,853
OPN	118	123	128	134	140	643
TOTAL	29,486	18,366	19,901	19,356	21,015	108,124

d. Manpower Economic Cost

The manpower economic cost for commercial contract manning is the same as for the commercial contract manpower FYDP cost. However, the MILDET is priced in the same way as Navy military manpower (described in subsection 2.d. above). These costs are summarized in Table 56.

e. Operations and Maintenance Economic Cost

The operations and maintenance economic cost for commercial contract manning was estimated in the same way as for Navy civil service manning, except the estimated agency fee (from subsection 4.b.) was included, and the MSC overhead figure was 4%. These costs are shown in Tables 57 and 58.

f. Total Economic Cost

The total economic cost to DOD and the U.S. Government are shown in Tables 57 and 58.

TABLE 56

MANPOWER ECONOMIC COST
COMMERCIAL CONTRACT MANNING
(FY 82 $K)

Economic Cost to DOD

	NECC			PROPOSED MSC CREW		
	CIVILIANS	MILDET	TOTAL	CIVILIANS	MILDET	TOTAL
TAE	9,129	698	9,827	6,971	871	7,842
TAFS	10,115	384	10,499	7,284	871	8,155

Economic Cost to U.S. Government

	NECC			PROPOSED MSC CREW		
	CIVILIANS	MILDET	TOTAL	CIVILIANS	MILDET	TOTAL
TAE	9,129	733	9,862	6,971	915	7,886
TAFS	10,115	403	10,518	7,284	917	8,201

TABLE 57

ANNUAL ECONOMIC OPERATING COST TO DOD
COMMERCIAL CONTRACT MANNING
(FY 82 $K)

	TAE	
	NECC	PROPOSED MSC CREW
Manpower	9,827	7,842
Operations and Maintenance	10,666	10,563
Total	20,493	18,405

	TAFS	
	NECC	PROPOSED MSC CREW
Manpower	10,499	8,155
Operations and Maintenance	10,183	10,134
Total	20,682	18,289

TABLE 58

ANNUAL ECONOMIC OPERATING COST TO U.S. GOVERNMENT
COMMERCIAL CONTRACT MANNING
(FY 82 $K)

	TAE	
	NECC	PROPOSED MSC CREW
Manpower	9,862	7,886
Operations and Maintenance	10,666	10,563
Total	20,528	18,449

	TAFS	
	NECC	PROPOSED MSC CREW
Manpower	10,518	8,201
Operations and Maintenance	10,183	10,134
Total	20,701	18,335

g. Notional Modified Working Rules

As mentioned in subsection II.A.2.a, dedicated commercial contract crews have been proposed as one way of meeting the Navy's mobile logistics requirements for the two types of UNREP ships in this study. This subsection presents the economic cost estimates for a commercial contract crew aboard the AE and AFS with the modified crew concept. These costing rules were taken from the National Maritime Union (NMU) contract with Marine Transport Lines, Inc. (MTL) and the Trinidad Corporation. MTL operates 9 sealift type ships; the Trinidad Corporation operates 5 T-5 tankers and 4 Columbia type tankers. Article I, Section 22 of the Master agreement stipulates that vacations for NMU members employed aboard these ships accrue at 5 days for each 30 days worked. The 210 day rule (which requires a member to relinquish his billet after working for 210 days) is also eliminated.

As a result of these two provisions, the following reduced employer contributions for unlicensed personnel are: 21% of base pay for vacations, $12.24 per manday for pension contributions, and $5.22 per manday for welfare contributions.[50/] Employer contributions for officers are the same as in the earlier parts of Section IV.

To make an estimate of the manpower cost under the Notional Modified Working Rules, these rates were applied to the NECC and the proposed MSC crew for the two UNREP ships. The resulting costs are presented in Table 59. The results indicate that this reduced manpower cost still exceeds the Navy civil service manpower cost.

TABLE 59

COMMERCIAL CONTRACT NOTIONAL MODIFIED
WORK RULE COST ESTIMATES
(FY 82 $)

	TAE-26		TAFS-1	
	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
Crew Size	169	121	183	125
Navy Civil Service Manpower Cost Excluding Det	6,380,179	4,853,268	7,645,843	5,499,164
Commercial Contract Manpower Cost Excluding MILDET (Current Work Rules)	9,128,648	6,971,403	10,114,858	7,284,287
Commercial Contract Manpower Cost Excluding MILDET (Proposed Work Rules)	8,991,335	6,882,948	9,984,222	7,209,855

50/ The data presented in Appendix K is based on the SIU wage scale, which combines the pension and welfare costs together in the pension column. As noted, the NMU accounted for these costs separately.

h. Breakeven Analysis

To provide decision makers with an understanding of the factors which drive commercial contract manpower cost, as well as the magnitude of these factors, it is useful to conduct breakeven cost analyses. This analysis would tend to show the changes necessary to reduce the commercial contract manpower cost to equal the Navy civil service manpower economic cost. Three analyses are presented below. These are hypothetical and may not be achievable in the event of negotiations.

- What is the breakeven vacation accrual rate for commercial contract manning?
- What is the breakeven base pay for commercial contract manning at equal crew levels?
- What is the breakeven crew size for commercial contract manning, and what operational impact will this have on the ship?

(1) Breakeven vacation accrual rate. The vacation accrual covers the cost of hiring replacement personnel when a crew member is on vacation. This analysis sought to reduce the vacation accrual, or requirement for supernumerary personnel, in an attempt to make the commercial contract manpower cost equal to the Navy civil service manpower economic cost. Mathematically, it was not possible to break even with Navy civil service manning even when vacations were reduced to zero, and the pension and welfare accrual rates for the NMU contract were used. The results of this analysis are shown in Table 60.

(2) Breakeven base pay. This analysis reduced commercial contract base pay to the point at which total commercial contract manning cost the same as total Navy civil service manning economic cost at equal crew levels. In order to break even, the base pay of commercial contract mariners must be reduced by: 36.8% for the TAE-26 NECC, 34.9% for the TAE-26 proposed MSC crew, 26.0% for the TAFS-1 NECC, and 24.4% for the TAFS-1 proposed MSC crew.

TABLE 60

MODIFIED COMMERCIAL CONTRACT VACATION
ACCRUAL ANALYSIS
(FY 82 $)

	TAE-26		TAFS-1	
	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
Navy Civil Service Manpower Cost Excluding MILDET	6,380,179	4,853,268	7,645,843	5,499,164

	TAE-26		TAFS-1	
	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
Commercial Contract Manpower Cost Excluding MILDET (Proposed Rules from Table 59 and 0 Vacation)	7,903,194	5,977,602	8,782,835	6,268,901

The analysis made two assumptions. First, all commercial contract personnel (licensed and unlicensed) were assumed to accrue vacation at a rate of 21% base pay. This extends the NMU contract changes (discussed above) for unlicensed personnel to licensed personnel, and excludes Feinberg contributions (to licensed pension funds when members are on vacation) from the analysis. Second, costs for employment commission, special account, and Transportation Institute costs are excluded from the analysis. Employment commission was assumed to be unnecessary for a dedicated certified crew. Special account and Transportation Institute costs are contributions for education and research, and were excluded because several unions no longer make the contribution.

(3) Breakeven crew size. The analysis developed the economic cost per billet from the total commercial contract manpower cost (under the current working rules), and then computed the number of commercial contract billets that could be funded with the total Navy civil service manpower economic cost. This

allowed the computation of the number of billets that must be cut from the commercial contract manning level to break even with Navy civil service manpower economic cost. The breakeven crew size equals the Navy civil service manpower cost (excluding MILDET) divided by the commercial contract cost per billet. The commercial contract cost per billet equals the commercial contract manpower cost (excluding MILDET) divided by the civilian crew size. The results (shown in Table 61) translate into a reduction of approximately 3 replenishment stations in the NECC crews for each ship, and 2 replenishment stations for the proposed MSC crews for each ship. This would roughly cut the underway replenishment capability in half in each case based upon the analysis in Section III.

TABLE 61

BREAKEVEN CREW SIZE ANALYSIS
(FY 82 $)

	TAE-26		TAFS-1	
	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
Civilian Crew Size	169	121	183	125
Navy Civil Service Manpower Cost Excluding Military Det	6,380,179	4,853,268	7,645,843	5,499,164
Commercial Contract Manpower Cost Excluding MILDET (Current Work Rules)	9,128,648	6,971,403	10,114,858	7,284,287
Naval Civil Service Cost Per Man	37,753	40,110	41,781	43,993
Commercial Contract Cost Per Man (Current Rules)	54,016	57,615	55,272	58,274
Breakeven Commercial Contract Crew Size	118	84	138	94
Reduction From Planned Crew	51	37	45	31

B. DESTROYER TENDER

1. Introduction

A comprehensive cost analysis was conducted for each manning option: Navy military, Navy civil service, and commercial contract. The two civilian manning options were priced with a commercial contract repair crew and a Navy military repair crew. Because of data limitations, it was not possible to obtain an estimate of a Navy civil service repair crew.

The cost measures used were: Five-Year Defense Plan (FYDP) profile, economic cost to the DOD, and economic cost to the U.S. Government. The cost analysis is consistent with the rules published for POM 84.

Additional background material on the cost measures is contained in subsection V.A.1.

To address the issue of cost effectiveness at equal capability levels, the full SMD manning was priced for the Navy military option; for the two civilian options, the NECC operating crew and NECC repair crew were priced, as well as the NECC operating crew and the Navy military repair crew from the full SMD. It was decided to price the NECC operating crew rather than the proposed MSC operating crew because they differ by 8 men, which is less than 1% of the total ship's manpower when civilian manned. In addition, the Navy military manned option and the Navy uniformed repair crew and military detachment in the two civilian options also were priced at 85% of SMD cost. This has been assumed to be a reasonable reflection of actual Navy manning in both CIV77 and this study. To simplify the presentation, the military detachment manpower cost was consistently priced at the full SMD cost when those personnel are the only Navy military personnel aboard ship.

To quantify the cost range of the civilian habitation modification versus conversion question, the two civilian manning

options were also priced with the reconfiguration cost estimates developed by MSC and M. Rosenblatt & Son, Inc.

2. Navy Military Cost

a. Manpower FYDP Cost

The Navy military manpower FYDP cost was estimated in the same way as it was for the UNREP ships. This is described in subsection V.A.2.a.

The total direct and indirect MPN costs for the Navy military crew are $35.102 million for full SMD manning, and $29.837 million for 85% SMD manning. Detailed calculations are shown in Appendix G.

b. Operations and Maintenance FYDP Cost

The Navy military operations and maintenance FYDP cost estimates were developed in exactly the same manner as for the UNREP ships, described in subsection V.A.2.b. The November 1980 Navy Program Factors Manual states that the AD-37 class ships undergo an 8 month overhaul every 60 months. The AD-37 operations and maintenance FYDP cost data is detailed in Table 62.

TABLE 62

AD-37 OPERATIONS AND MAINTENANCE FYDP COST DATA
NAVY MILITARY MANNING
(FY 82 $)

Cost Element	Cost
Temporary Additional Duty (TAD)	$ 41,529
Ship POL	2,919,980
Repair Parts	244,012
Supplies	640,063
Training Expendable Stores	3,097
Purchased Services	601,690
Direct Intermediate Maintenance	2,453,621
Regular Overhaul	5,312,248
RA/TRA/SRA	712,030
FMP (OMN Funded)	3,592,942
FMP (OPN Funded)	789,583
Other Depot Costs	108,026
Direct Recurring Investment	23,291

c. FYDP Profile

The FYDP cost profile is shown in Table 63 for full SMD manning and Table 64 for 85% SMD manning. For analytical purposes, it was assumed that the ship would begin ROH at the beginning of FY 84. The annual costs were then escalated by factors consistent with POM 84-7/Change 2 to derive the TOA estimates.

TABLE 63

AD-37 FYDP PROFILE
FULL SMD MANNING
NAVY MILITARY MANNING
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	35,102	35,102	35,102	35,102	35,102	175,510
OMN	43,887	17,050	17,815	18,657	19,462	116,871
OPN	868	908	948	990	1,034	4,748
TOTAL	79,857	53,060	53,865	54,749	55,598	297,129

TABLE 64

AD-37 FYDP PROFILE
85% SMD MANNING
NAVY MILITARY MANNING
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	29,837	29,837	29,837	29,837	29,837	149,185
OMN	43,518	16,666	17,414	18,239	19,027	114,864
OPN	868	908	948	990	1,034	4,748
TOTAL	74,223	47,411	48,199	49,066	49,898	268,797

d. Manpower Economic Cost

The Navy military manpower economic cost was developed from the FY 1981 edition of the Navy Billet Cost Model (NBCM), in the same way as the manpower economic costs for the UNREP ships were developed. Additional information on this method is found in subsection V.A.2.d.

The AD-37 Navy military manpower economic cost to DOD is $29.956 million at the SMD level and $25.463 mllion at the 85% SMD level; the AD-37 Navy military manpower economic cost to the U.S. Government is $31.430 million at the SMD level and $26.716 million at the 85% SMD level. Detailed calculations are shown in Appendix H.

e. Operations and Maintenance Economic Cost

The operations and maintenance economic cost element breakdown structure and estimates are shown in Table 65. The economic cost measure is an annual operations and maintenance cost. Regular overhaul is estimated as an average annual cost. Indirect logistics cost is estimated because the MSC overhead cost includes these costs per CIVMAN, Vol. III, pp B-80, B-83.

f. Total Economic Cost

The AD-37 annual total economic cost to DOD is $49.517 million at the SMD level and $45.024 million at the 85% SMD level; the AD-37 annual total economic cost to the U.S. Government is $50.991 million at the SMD level and $46.277 million at the 85% SMD level.

TABLE 65

AD-37 OPERATIONS AND MAINTENANCE ECONOMIC COST
NAVY MILITARY MANNING
(FY 82 $)

Cost Element	Cost
Indirect Logistics (13% Direct OMN)*	$ 2,159,535
Ship POL	2,919,980
Repair Parts	244,012
Supplies	640,063
Training Expendable Stores	3,907
Purchased Services	601,690
Direct Intermediate Maintenance	2,453,621
Regular Overhaul	5,312,248
RA/TA/SRA	712,030
FMP (OMN Funded)	3,592,942
FMP (OPN Funded)	789,583
Other Depot Costs	108,026
Direct Recurring Investment	23,291
Total Operations & Maintenance Economic Cost	$19,560,928

*Direct OMN is $16,611,810

3. Costs for Navy Civil Service Operating Crew Options

a. Manpower FYDP Cost

The Manpower FYDP cost is the cost for the operating crew, the repair crew, and the MILDET. The operating crew manpower cost (which is funded with OMN dollars) was priced using the same methodology as the UNREP ships, except that overtime was 46% base pay as used in CIVMAN. This methodology is outlined in Table 40 and documented in subsection V.A.3.a. Detailed calculations are shown in Appendix I. The MILDET cost (which was funded with MPN dollars) was estimated in the same manner as the Navy military manpower FYDP cost detailed in subsections V.A.2.a and V.B.2.a.

In developing the repair crew cost, it was assumed that it could be manned either with civilians or military personnel. If civilian manned, the repair crew cost would be funded with OMN

dollars; if Navy military manned, the repair crew would be funded with MPN dollars. The approach used to estimate the commercial contract repair crew cost was to contact private shipyards, present them with the NECC developed in subsection II.B.2.a, and obtain a cost estimate. As part of this effort, it was requested that a remote and arduous duty premium be estimated. The yards advised that no historical precedent was available with which to estimate this premium: while these organizations had sent craftsmen to locations away from their main yard, they had not sent anyone abroad for an extended period of time. The yards suggested that such a premium would be developed through negotiation.

Since it was not possible to obtain a billet-by-billet cost for a civilian repair crew, other sources were researched. The Shipbuilder's Council estimates for 1980 hourly compensation (including wages, retirement, health insurance, vacation, and overtime) of shipbulding production workers was $11.94, which translates to $13.68 in FY 82 dollars with the escalators used in this study.51/ For overseas duty, consultation with personnel who have lived abroad as employees of American firms indicates that 50 percent of total compensation in the U.S. is a reasonable premium for an assignment abroad plus an additional 15 percent for housing. When escalated for the 4% MSC overhead cost, the commercial contract repair crew cost was estimated at $46.202 million per year.

In order to derive a cost estimate for a Navy civil service repair crew, it was intended to obtain a similar NECC cost estimate from the Navy. However, the Navy advised that such information was not releaseable. Therefore, it was not possible to calculate a cost estimate for a Navy civil service repair crew.

51/ Shipbuilder's Council of America, Statistical Quarterly, First Quarter 1982.

The Navy military repair crew cost was estimated in the same manner as all other Navy military manpower FYDP costs. Detailed explanation of the procedure is found in subsections V.A.2.a and V.B.2.a. Detailed calculations are shown in Appendix G.

Table 66 displays the manpower FYDP cost estimates for the TAD-37 options using a Navy civil service operating crew.

TABLE 66

TAD-37 TOTAL DIRECT AND INDIRECT
MANPOWER FYDP COST
NAVY CIVIL SERVICE MANNING
(FY 82 $ K)

	COMMERCIAL CONTRACT REPAIR CREW OPTION	NAVY MILITARY REPAIR CREW OPTION	
		FULL SMD	85% SMD
OPERATING CREW (CIV SVC.)	5,289	$ 5,289	$ 5,289
MILITARY DETACHMENT	1,674	1,674	1,423
REPAIR CREW	46,202	26,228	22,294
TOTAL	53,165	33,191	29,006

b. Operations and Maintenance FYDP Cost

The operations, maintenance, and repair cost elements and data sources for the options using a Navy civil service operating crew are the same as used for the UNREP ships (see subsection V.B.3.b), with the exception of the civilian modification cost.

As noted above, civilian modification cost estimates were developed for this study by MSC and also by M. Rosenblatt & Son, Inc. MSC estimated a cost of $26 million and Rosenblatt estimated a cost of $5.338 million. These estimates were discussed in subsection III.B.1 and are displayed in their entirety in Appendices E and J.

The operations and maintenance FYDP costs are shown in Tables 67 through 72.

TABLE 67

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	6,975	27,902	27,902	27,902	27,902	118,583
OMN	38,861	17,476	20,099	18,655	21,490	116,581
OPN	868	908	948	990	1,034	4,748
TOTAL	46,704	46,286	48,949	47,547	50,426	239,912

*Assumes MSC CIVMOD Estimate

TABLE 68

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	6,975	27,902	27,902	27,902	27,902	118,583
OMN	16,791	17,476	20,099	18,655	21,490	94,511
OPN	868	908	948	990	1,034	4,748
TOTAL	24,634	46,286	48,949	47,547	50,426	217,842

*Assumes Rosenblatt CIVMOD Estimate

TABLE 69

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
COMMERCIAL CONTRACT REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	419	1,674	1,674	1,674	1,674	7,115
OMN	49,952	61,762	64,306	62,771	65,524	304,315
OPN	868	908	948	990	1,034	4,748
TOTAL	51,239	64,334	66,928	65,435	68,232	316,178

*Assumes MSC CIVMOD Estimate

TABLE 70

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
COMMERCIAL CONTRACT REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	419	1,674	1,674	1,674	1,674	7,115
OMN	27,882	61,762	64,306	62,771	65,524	282,245
OPN	868	908	948	990	1,034	4,748
TOTAL	29,169	64,344	66,928	65,435	68,232	294,108

*Assumes Rosenblatt CIVMOD Estimate

TABLE 71

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	5,929	23,717	23,717	23,717	23,717	100,797
OMN	38,787	17,170	19,781	18,322	21,144	115,204
OPN	868	908	948	990	1,034	4,748
TOTAL	45,584	41,795	44,446	43,029	45,895	220,749

*Assumes MSC CIVMOD Estimate and 85% Navy Military Manpower Cost

TABLE 72

TAD-37 FYDP PROFILE
NAVY CIVIL SERVICE OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	5,929	23,717	23,717	23,717	23,717	100,797
OMN	16,717	17,170	19,781	18,322	21,144	93,134
OPN	868	908	948	990	1,034	4,748
TOTAL	23,514	41,795	44,446	43,029	45,895	198,679

*Assumes Rosenblatt-CIVMOD Estimate and 85% Navy Military Manpower Cost

c. FYDP Profile

As in the case of the UNREP ships, the MSC Engineering Office indicated that 9 months was a reasonable amount of time to convert the ship to civilian habitability standards. This interval was used for both MSC and Rosenblatt estimates since the Rosenblatt study was not tasked to estimate a separate modification time. Tables 67 through 72 present the FYDP cost estimates for the tender under the various program alternatives outlined above.

d. Manpower Economic Cost

For the operating crew, the annual manpower economic cost was developed using the Navy civil service cost methodology in which the manpower economic cost is the same as the manpower FYDP cost with the exception that the annual retirement cost is estimated at 20.4% of base pay for the economic cost rather than 7% base pay for FYDP cost. Detailed calculations are shown in Appendix I.

For the MILDET, the method used to compute the manpower economic cost was based on the Navy Billet Code Model (NBCM). This is the same method used for estimating Navy military personnel economic cost throughout this study.

The civilian repair crew manpower economic cost is the same as for the civilian repair crew manpower FYDP cost, because the civilian repair crew is assumed to be commercial contract manned.

The military repair crew manpower economic cost is priced with the NBCM method used for Navy military personnel in this study. Detailed calculations are shown in Appendix H.

The manpower economic costs are shown in Tables 73 and 74.

e. Operations and Maintenance Economic Cost

This cost is similar to the operations and maintenance FYDP cost, except for the following: first, all recurring maintenance costs were annualized over the MSC 2-year overhaul cycle. Second, each civilian modification cost estimate (one prepared by MSC and one prepared by Rosenblatt) is amortized over the remaining 23 years of the AD-37s assumed 40 year life cycle.[52]

The operations and maintenance economic costs are shown in Tables 73 and 74.

f. Total Economic Cost

The total economic cost to DOD and the U.S. Government are shown in Tables 73 and 74.

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[52] CIVMAN, Volume III, p. B-79.

TABLE 73

TAD-37 ANNUAL ECONOMIC COST TO DOD
NAVY CIVIL SERVICE OPERATING CREW OPTIONS
(FY 82 $)

	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW	
		FULL SMD	85% SMD
Operating Crew (CIV. SVC.)	$ 5,346,519	$ 5,346,519	$ 5,346,519
Repair Crew	46,201,992	22,525,621	19,146,778
MILDET	1,401,728	1,401,728	1,191,469
Manpower Economic Cost To DOD	52,950,239	29,273,868	25,684,766
O&S Cost*	11,763,813	11,763,813	11,763,813
Total Economic Cost To DOD*	64,714,052	41,037,681	37,448,579
O&S Cost**	10,877,070	10,877,070	10,877,070
Total Economic Cost TO DOD**	63,827,309	40,150,938	36,561,836

* Based on MSC CIVMOD Estimate
**Based on Rosenblatt CIVMOD Estimate

TABLE 74

TAD-37 ANNUAL ECONOMIC COST TO U.S. GOVERNMENT
NAVY CIVIL SERVICE OPERATING CREW OPTIONS
(FY 82 $)

	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW	
		FULL SMD	85% SMD
Operating Crew	$ 5,346,519	$ 5,346,519	$ 5,346,519
Repair Crew	46,201,992	23,632,488	20,087,615
MILDET	1,471,776	1,471,776	1,251,010
Manpower Economic Cost To U.S. Government	53,020,287	30,450,783	26,685,144
O&S Cost*	11,763,813	11,763,813	11,763,813
Total Economic Cost To U.S. Government*	64,784,100	42,214,596	38,448,957
O&S Cost*	10,877,070	10,877,070	10,877,070
Total Economic Cost TO U.S Government**	63,897,357	41,327,853	37,562,214

* Based on MSC CIVMOD Estimate
**Based on Rosenblatt CIVMOD Estimate

4. Costs for Commercial Contract Operating Crew Options

a. Manpower FYDP Cost

The manpower FYDP costs for the commercial contract repair crew, the Navy military repair crew, and the MILDET on the tender are estimated in exactly the same manner as they were in the Navy civil service operating crew options. The commercial contract operating crew cost was developed from data supplied by MARAD, and additional documentation is presented in subsection V.A.4.a. Detailed calculations are shown in Appendix K. Documentation on the MILDET, military repair crew, and civilian repair crew cost is presented in subsection V.B.3.a. The civilian personnel costs (operating and repair crew) are funded under OMN; the Navy military personnel costs (MILDET and repair crew) are funded under MPN. Table 75 shows the total direct and indirect manpower FYDP costs.

TABLE 75

TAD-37 TOTAL DIRECT AND INDIRECT
MANPOWER FYDP COST
COMMERCIAL CONTRACT MANNING
(FY 82 $ K)

	COMMERCIAL CONTRACT REPAIR CREW OPTION	NAVY MILITARY REPAIR CREW OPTION	
		FULL SMD	85% SMD
OPERATING CREW (COMMER)	$ 8,547	$ 8,547	$ 8,547
MILITARY DETACHMENT	1,674	1,674	1,423
REPAIR CREW	46,202	26,228	22,294
TOTAL	56,423	36,449	32,264

b. Operations and Maintenance FYDP Cost

The operations and maintenance FYDP cost estimates used for the Navy civil service operating crew options were assumed to be equally applicable to commercial contract operating crew operations and maintenance costs as in the CIVMAN study.[53] To these costs is added the annual estimated agency fee ($122,224) from CIVMAN.[54] Separate FYDP cost estimates were made with the MSC and Rosenblatt civilian modification costs. The operations and maintenance FYDP costs are shown in Tables 76 through 81.

c. FYDP Profile

The same assumptions used to derive the FYDP profiles for the Navy civil service operating crew options were used to derive the FYDP profiles for the commercial contract operating crew options. Tables 76 through 81 present the FYDP cost estimates for the tender under the various commercial contract operating crew program alternatives outlined above.

d. Manpower Economic Cost

The manpower economic costs for the commercial contract operating and repair crew are the same as the manpower FYDP costs. The MILDET and military repair crew manpower economic costs are developed from the Navy Billet Cost Model (NBCM), as are all Navy and military economic manpower costs in this study. The manpower economic costs are shown in Tables 82 and 83.

53/CIVMAN, Volume III, p B 86-87.

54/U.S. Maritime Administration, letter from Mr. A. W. Friedberg to Mr. I. N. Blickstein, June 1, 1977.

TABLE 76

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	6,975	27,902	27,902	27,902	27,902	118,583
OMN	39,357	20,781	23,386	21,963	24,779	130,266
OPN	868	908	948	990	1,034	4,748
TOTAL	47,200	49,591	52,236	50,855	53,715	253,597

*Assumes MSC CIVMOD Estimate

TABLE 77

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	6,975	27,902	27,902	27,902	27,902	118,583
OMN	17,497	20,781	23,386	21,963	24,779	108,406
OPN	868	908	948	990	1,034	4,748
TOTAL	25,340	49,591	52,236	50,855	53,715	231,737

*Assumes Rosenblatt CIVMOD Estimate

TABLE 78

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
COMMERCIAL CONTRACT REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	419	1,674	1,674	1,674	1,674	7,115
OMN	50,447	65,067	67,592	66,079	68,813	317,998
OPN	868	908	948	990	1,034	4,748
TOTAL	51,734	67,649	70,214	68,743	71,521	329,861

*Assumes MSC CIVMOD Estimate

TABLE 79

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
COMMERCIAL CONTRACT REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	419	1,674	1,674	1,674	1,674	7,115
OMN	28,587	65,067	67,592	66,079	68,813	296,138
OPN	868	908	948	990	1,034	4,748
TOTAL	29,874	67,649	70,214	68,743	71,521	308,001

*Assumes Rosenblatt CIVMOD Estimate

TABLE 80

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	5,929	23,717	23,717	23,717	23,717	100,797
OMN	39,284	20,475	23,067	21,630	24,433	128,889
OPN	868	908	948	990	1,034	4,748
TOTAL	46,081	45,100	47,732	46,337	49,184	234,434

*Assumes MSC CIVMOD Estimate and 85% Navy Military Manpower Cost

TABLE 81

TAD-37 FYDP PROFILE
COMMERCIAL CONTRACT OPERATING CREW
NAVY MILITARY REPAIR CREW*
(FYDP $ K) (FY 84 - FY 88)

	FY 84	FY 85	FY 86	FY 87	FY 88	TOTAL
MPN	5,929	23,717	23,717	23,717	23,717	100,797
OMN	17,423	20,475	23,067	21,630	24,433	107,028
OPN	868	908	948	990	1,034	4,748
TOTAL	24,220	45,100	47,732	46,337	49,184	212,573

*Assumes Rosenblatt CIVMOD Estimate and 85% Navy Military Manpower Cost

e. Operations and Maintenance Economic Cost

The operations and maintenance economic cost for the commercial contract operating crew options were estimated in the same way as the Navy civil service operating crew options, except that the estimated agency fee was included and the MSC overhead figure was 4%. The operations and maintenance economic costs are shown in Tables 82 and 83.

f. Total Economic Cost

The total economic cost to DOD and the U.S. Government are shown in Tables 82 and 83.

TABLE 82

TAD-37 ECONOMIC COST TO DOD
COMMERCIAL CONTRACT MANNING OPERATING CREW OPTIONS
(FY 82 $)

	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW	
		FULL SMD	85% SMD
Operating Crew (COMMER)	$ 8,547,132	$ 8,547,132	$ 8,547,132
Repair Crew	46,201,992	22,525,621	19,146,778
MILDET	1,401,728	1,401,728	1,191,469
	56,150,852	32,474,481	28,885,379
O&S Cost*	11,786,410	11,786,410	11,786,410
Total Economic Cost To DOD*	67,937,262	44,260,891	40,671,789
O&S Cost**	10,908,111	10,908,111	10,908,111
Total Economic Cost TO DOD**	67,058,963	43,382,592	39,793,490

* Based on MSC CIVMOD Estimate
**Based on Rosenblatt CIVMOD Estimate

TABLE 83

TAD-37 ECONOMIC COST TO U.S. GOVERNMENT
COMMERCIAL CONTRACT OPERATING CREW OPTIONS
(FY 82 $)

	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW	
		FULL SMD	85% SMD
Operating Crew	$ 8,547,132	$ 8,547,132	$ 8,547,132
Repair Crew	46,201,992	23,632,488	20,087,615
MILDET	1,471,776	1,471,776	1,251,010
Manpower Economic Cost To U.S. Government	56,220,900	33,651,396	29,885,757
O&S Cost*	11,786,410	11,786,410	11,786,410
Total Economic Cost To U.S. Government*	68,007,310	45,437,806	41,672,167
O&S Cost**	10,908,111	10,908,111	10,908,111
Total Economic Cost To U.S. Government**	67,129,011	44,559,507	40,793,868

* Based on MSC CIVMOD Estimate
**Based on Rosenblatt CIVMOD Estimate

VI. SUMMARY OF FINDINGS

This section summarizes the analysis and the findings presented in this report.

A. MANPOWER

The civilian crews are smaller than the Navy military crew for all three ships. The crews are summarized in Table 84.

TABLE 84

MANPOWER COMPARISON*

SHIP CLASS	NAVY MILITARY MANNING	NAVY CIVIL SERVICE		COMMERCIAL CONTRACT MANNING	
		NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE***	392	201	159	201	159
AFS	435	201	163	201	163
AD Operating Crew	291	221	213	221	213
AD Military Repair Crew	1114	1042	**	1042	**
AD Civilian Repair Crew	N/A	946	**	946	**

* Includes Military Detachment, but not Helicopter Detachment
** No crew proposed
*** AE-26 Navy military manning based on six simultaneous UNREP station capability to be consistent with TAE-26 POE

The Navy SMD for the AE-26 was reduced by 24 billets which were assumed to be needed to man 24 UNREP positions on two UNREP stations. This was done to give the AE-26 a six simultaneous station capability that the TAE-26 POE requires, rather than an eight-station capability that the AE-26 POE requires.

The Notional Equal Capability Crew (NECC) was developed to meet the Navy's stated capability requirements with civilian personnel. For the UNREP ships and the tender operating crew, the NECC was derived from the SMD watch and station bill. For the tender repair crew, the NECC was derived from the SMD Workload Breakdown of Required Maintenance Manhours.

If commercial contract operation of auxiliaries is to occur, specific congressional legislation will be necessary. To meet Navy requirements for the UNREP ships, dedicated and trained crews are necessary. The Military Sealift Command (MSC) presently operates with dedicated Navy civil service crews, and will require any contractor to obtain dedicated crews also. Requirements for dedicated crews were incorporated into a Request for Proposal to crew a set of government owned T-1 tankers. The training required to operate the UNREP ships, while necessary, could be incorporated into existing industry training facilities. These requirements for a trained and dedicated crew were designated the Notional Modified Crew Concept.

If civilian manning were used on all remaining Navy military manned AE-26, AFS-1, and AD-37 class ships, 377 officer billets and 7826 enlisted billets would be lost. This reduces sea going officer billets which provide at sea experience necessary for promotion opportunities. This reduction in sea going billets will be alleviated as the number of combatant ships increases. The enlisted billet reductions represent 3845 journeyman level (E-4 to E-6) petty officers which is roughly 2% of the current petty officer shortage. This would enable the Navy to distribute these shortage category personnel to combatant ships to alleviate the overall problem.

B. CAPABILITY

The analysis assumed that the UNREP ships were required to provide equal capability in Readiness Condition IV under all three manning options. A ROC/POE comparison was made which indicated that logistics, mobility, and fleet support operations require equal capability from each type of crew, but that civilian crews are not required to perform in anti-air and anti-surface warfare operations.

An analysis of the proposed MSC crews on the UNREP ships indicates that they are capable of manning four UNREP stations simultaneously compared to the civilian manned POE requirement of six stations. In routine peacetime shuttle operations, four stations are probably sufficient. However, this assumes that no civilian manned ship will operate as a station ship, which is current Navy practice. On Navy military manned ships, the Navy military crew has some capability to replace a portion of the UNREP personnel in less specialized positions with personnel who routinely perform non-UNREP duties. This gives a Navy military crew some additional endurance over a civilian manned ship.

For the tender, the question of the feasibility of civilian operation was researched. The analysis assumed that the repair crew, either civilian or military manned, must provide equal wartime logistics and fleet support capabilities as indicated in the SMD. There is a disagreement on the question of the feasibility of civilian operation: although MSC developed a conversion cost, it indicated that civilian manning of the AD-37 is probably impractical due to crew size and limited space. However, M. Rosenblatt and Son, Inc., developed both a plan and cost estimate to modify the tender to MSC Habitability Standards. The MSC estimate appears to be based on a conversion, while the Rosenblatt estimate appears to be a minimum cost modification.

A comparison of the Navy ROC/POE for the AD-37, in conjunction with the civilian crew assumptions, indicated that provision

of civilian habitability requirements for the civilian operating crew required removal of the flag quarters. In addition, offship housing would be required for a civilian repair crew.

C. OPERATIONS

The operations were analyzed by developing Notional Operational Schedules for the military manned and the equal capability civilian manned UNREP ships. The results indicate that the civilian manned TAE peacetime availability for UNREP duty at sea is 78% greater than the military manned AE, and the civilian manned TAFS peacetime availability is 66% greater than the military manned AFS. These results are driven by the shorter maintenance down time for civilian manned UNREP ships.

For the tender, the operations analysis showed that this ship may be able to provide 10 extra customer support days per year if civilian manned and homeported overseas. When Navy military manned, the AD-37 was in port 334 days per year during FY78 - FY80. The analysis showed that there is no available housing for the civilian repair crew in Diego Garcia, but there is substandard military housing in Rota and Subic Bay, and commercial housing in Naples and Yokosuka.

D. COST

1. UNREP Ships

The major results of the cost analysis for the UNREP ships are displayed in Tables 85 and 86. It is appropriate to compare the full SMD for the Navy military option with the NECC for the civilian options, and the Navy military 85% SMD with the proposed MSC crews. The Navy military cost in the 85% SMD columns can be interpreted as the amount the Navy is likely to pay, and can thus be compared to civilian costs for the NECC and proposed MSC crews.

a. Manpower Cost Summary

Both the FYDP and economic manpower cost estimates indicate that Navy civil service manning is more economical on an equal capability basis than either of the two other manning options. This reflects a reduction in number of crew members compared to the Navy military option and a lower cost per man compared to the commercial contract option. The cost of vacations and pensions is the major cost driver in the commercial contract option. It is noteworthy, however, that the total base pay of the two civilian options are within a few percent of each other for equal capability crews.

In CIVMAN, the Navy civil service option was found to be most economical. Subsequently, Navy civil service manpower costs rose, but Navy military manpower costs were held down until 1980. This was reflected in CIV 77 which indicated that 85% of Navy military SMD manpower cost was less expensive than Navy civil service manpower cost. The results of the present study, which used data reflecting all military pay raises up to February 1982, indicate that Navy civil service manpower cost is again the most economical of the options available.

The commercial contract manpower costs are based on current work rules and are the subject of both further investigation and a breakdown analysis discussed in Section V.

The difference in cost between the proposed MSC crew and the NECC in each civilian manning option is a cost savings with a capability reduction from the POE requirement.

An anomaly of this study is that the FYDP Navy military manpower cost is higher than the economic costs. This is an unexpected result since the economic costs include retirement and training downtime while the FYDP cost does not. Consultation with cognizant personnel indicates that this is attributable to the differences in data collection and cost estimation procedures of these two data bases.

TABLE 85

MANPOWER COST SUMMARY

ANNUAL MANPOWER FYDP COST*
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	8,982	7,635	6,836	5,613	9,954	8,013
AFS	10,210	8,678	7,673	6,274	10,572	8,373

ANNUAL MANPOWER ECONOMIC COST TO DOD*

(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	7,502	6,376	7,078	5,724	9,827	7,842
AFS	8,502	7,226	8,030	6,370	10,499	8,155

ANNUAL MANPOWER ECONOMIC COST TO U.S. GOVERNMENT

(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE**	7,873	6,692	7,113	5,768	9,862	7,886
AFS	8,925	7,586	8,049	6,416	10,518	8,201

* Includes Military Detachment

** AE-26 Navy military manning is based on six simultaneous underway replenishment station capability to be consistent with the TAE-26 POE

In particular, it has recently been found that the training costs are understated in the NBCM. This Billet Cost Model is currently being revised. Unfortunately, this work began only recently and not enough information exists to correct the understatement at the present time.

Because the NBCM apparently understates the Navy military economic cost, caution is urged in concluding that the NECC manpower cost for the Navy civil service option is more expensive than the 85% Navy SMD cost which reflects operational Navy manning. It is possible that when the billet cost is corrected, the Navy military economic manpower cost will rise and the relative costs may change. The same caution applies to the relative cost of the Navy military manning and commercial contract manning options.

b. Total Cost Summary

The two economic cost measures indicate that both ships are operated most economically by Navy civil service mariners on an equal capability basis. However, the results indicate a cost savings of no more than 2% for the AE. The FYDP cost measures show that the AFS is operated most economically by Navy civil service mariners, while the AE is operated most economically by Navy military personnel.

When priced based on current work rules, the total economic operating costs show that commercial contract operation of the AFS is less costly than Navy military operation. This reflects the lower maintenance costs under civilian operation. For the AE, commercial contract economic operating costs appears to be more than Navy military economic operating cost, but these relative costs could change when the NBCM is updated.

The FYDP costs are higher than the economic costs on both of the ships. There are two major reasons for this: first, Navy

TABLE 86

TOTAL OPERATING COST SUMMARY

ANNUAL FYDP OPERATING COST
(FYDP $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	19,871	18,420	20,994	19,428	23,631	21,460
AFS	26,815	25,165	21,212	19,851	23,667	21,625

ANNUAL ECONOMIC OPERATING COST TO DOD
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	17,454	16,328	17,717	16,259	20,493	18,405
AFS	23,171	21,896	18,182	16,472	20,682	18,289

ANNUAL ECONOMIC OPERATING COST TO U.S. GOVERNMENT
(FY 82 $K)

SHIP CLASS	NAVY MILITARY MANNING		NAVY CIVIL SERVICE MANNING		COMMERCIAL CONTRACT MANNING	
	FULL SMD	85% SMD	NECC	PROPOSED MSC CREW	NECC	PROPOSED MSC CREW
AE*	17,825	16,644	17,752	16,303	20,528	18,449
AFS	23,595	22,256	18,201	16,518	20,701	18,335

* AE-26 Navy military manning is based on six simultaneous underway replenishment station capability to be consistent with TAE-26 POE

military manning costs are higher in the FYDP methodology than in the economic cost analysis due to data base differences which are beyond the scope of this study and thus preclude comparison of FYDP estimates with economic estimates. Second, both civilian options have the civilian modification costs prorated over five years in the FYDP estimates but over the remaining life of the ship in the economic estimates (24 years for the AE and 20 years for the AFS).

2. Destroyer Tender

Tables 87 and 88 present the cost estimates for the destroyer tender. The Navy military operating and repair crew full SMD results are presented to show an equal capability cost comparison to the NECC; the Navy military 85% SMD results are presented to show a cost comparison of the NECC and what the expenditures are likely to be for Navy military personnel.

a. Manpower Cost Summary

It was not possible to address the issue of the cost effectiveness of a Navy civil service repair crew because no data was available to estimate this cost. However, most previous civilian manning studies have indicated that Navy civil service manning and operation is most economical, though none of these studies have addressed a civilian repair crew or an overseas duty and housing premium for civilians.

The commercial contract repair crew cost exceeds the Navy military economic cost by at least 14%, even with no civilian overseas duty and housing premium.

When a Navy military repair crew is used with a civilian operating crew, the manpower costs are closer to the Navy military manpower costs. This reflects a reduction in number of billets in the civilian operating crews. The commercial contract

TABLE 87

AD-37 MANPOWER COST SUMMARY*

COST MEASURE (YEAR $)	NAVY MILITARY MANNING		NAVY CIVIL SERVICE (NECC) OPERATING CREW WITH			COMMERCIAL CONTRACT (NECC) OPERATING CREW WITH		
	FULL SMD	85% SMD	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW: FULL SMD	NAVY MILITARY REPAIR CREW: 85% SMD	COMMERCIAL CONTRACT REPAIR CREW	NAVY MILITARY REPAIR CREW: FULL SMD	NAVY MILITARY REPAIR CREW: 85% SMD
ANNUAL MANPOWER FYDP COST (FY82$K)	$35,102	$29,837	$53,165	$33,191	$29,006	$56,423	$36,449	$32,264
ANNUAL MANPOWER ECONOMIC COST TO DOD (FY82$K)	$29,956	$25,463	$52,950	$29,274	$25,685	$56,151	$32,474	$28,885
ANNUAL MANPOWER ECONOMIC COST TO US GOVT (FY82$K)	$31,430	$26,716	$53,020	$30,451	$26,685	$56,221	$33,651	$29,886

*Includes MILDET

operating crew is more expensive than the Navy civil service operating crew which is consistent with the UNREP ship results.

Because the Navy Billet Cost Model apparently understates the Navy military manpower economic cost, it is not clear that the combined commercial contract operating crew and Navy military repair crew cost is more expensive than the Navy military manpower cost. If the NBCM understatement factor is greater than the billet reduction factor in the crew when civilian operators drive the ship, the relative cost of a civilian operating crew and uniformed repair crew compared to a Navy military manned ship could change. In view of the relatively small size of the civilian operating crew compared to the total ship population, such a change is not likely to produce large cost savings, if any at all.

The combined Navy civil service operating crew and Navy military repair crew manpower costs are nearly equal to the Navy military manpower costs, and this result is unlikely to be changed from the apparent understatement of Navy military manpower costs in the NBCM, because the military repair crew is approximately 80 percent of the ship population when it has a civilian operating crew.

b. Total Cost Summary

When the Navy military manned AD-37 is considered as a baseline, the economic cost estimates indicate that use of a civilian operating crew and Navy military repair crew results in a cost savings, but that use of both a civilian operating and repair crew results in cost increases.

The results for a Navy military repair crew and either a Navy civil service or commercial contract operating crew show total operating cost savings compared to a total Navy military manned ship. These results reflect the lower estimated maintenance costs when the tender is operated by MSC rather than as a Navy military manned ship. This operating cost savings changes the

relative manpower cost results. Because of the understatement of the Navy military manpower economic cost in the NBCM noted above, it is likely that the relative cost differences will decrease among the various options. The FYDP cost estimates indicate the same results as the economic estimates for the Navy military repair crew and civilian operating crew options compared to the Navy military manned ship.

The economic cost estimates indicate that the most expensive option is the commercial contract operating crew and commercial contract repair crew. The Navy civil service operating crew and commercial contract repair crew is the second most expensive option. These results reflect the high cost of the commercial contract repair crew estimated in this analysis. It is noted that the FYDP cost for the two all civilian crews are less than the economic costs. This reflects the fact that manpower cost is roughly 80% of the cost for these two options and therefore outweighs any cost changes from prorating of civilian habitability modifications. The FYDP costs for the Navy military manned ship are greater than the economic costs reflecting the NBCM understatement noted above. The FYDP results for the all civilian manned options reflect the high cost of the commercial contract repair department and the fact that the civilian modification costs are charged in the FYDP period.

The M. Rosenblatt & Son, Inc., cost estimate of the ship civilian habitability modification results in a 5% cost savings in the economic cost estimates compared to the MSC civilian modification estimate. In the FYDP cost estimates, the cost savings is 10%. This civilian modification cost range does not change the relative cost of the various manning options, except in the FYDP costs for a Navy civil service operating crew and commercial contract repair crew.

TABLE 88

AD-37 TOTAL OPERATING COST SUMMARY*

COST MEASURE (YEAR $)	NAVY MILITARY MANNING		NAVY CIVIL SERVICE (NECC) OPERATING CREW WITH			COMMERCIAL CONTRACT (NECC) OPERATING CREW WITH		
	FULL SMD	85% SMD	COMMERCIAL CONTRACT REPAIR CREW*	NAVY MILITARY REPAIR CREW: FULL SMD*	NAVY MILITARY REPAIR CREW: 85% SMD*	COMMERCIAL CONTRACT REPAIR CREW*	NAVY MILITARY REPAIR CREW: FULL SMD*	NAVY MILITARY REPAIR CREW: 85% SMD*
AVERAGE ANNUAL OPERATING	59,426	53,759	58,822	43,568	39,736	61,600	46,347	42,515
FYDP COST (FY82$K)			63,236	47,982	44,150	65,972	50,719	46,887
ANNUAL OPERATING ECONOMIC COST TO DOD (FY82$K)	49,517	45,024	63,827	40,151	36,562	67,059	43,383	39,793
			64,714	41,038	37,449	67,937	44,261	40,672
ANNUAL OPERATING ECONOMIC COST TO US GOVT (FY82$K)	50,991	46,277	63,897	41,328	37,562	67,129	44,560	40,794
			64,784	42,215	38,449	68,007	45,438	41,672

* Costs estimated with M. Rosenblatt & Son, Inc. ship habitability modification (CIVMOD) cost are on left; costs estimated with MSC CIVMOD cost are offset to the right.

LIST OF REFERENCES

Commander, Military Sealift Command (COMSC), COMSC Memorandum Ser 50 M31, Oct. 4, 1977

Commander, Military Sealift Command, M-4EX, 4700, Ser 2046, May 17, 1982

Commander, Military Sealift Command (M-021), "Revision of the Atlantic and Pacific Schedule of Wages for MSC Mariners," Feb. 2, 1982

David M. Taylor Naval Ship Research and Development Center "Navy Energy Usage Profile Analyses," FY 78, FY 79, FY 80 editions

Department of Defense, Occupational Conversion Manual, Sept. 1980

Department of the Navy, Office of the Judge Advocate General, Ser 13/5492, May 19, 1977

M. Rosenblatt & Son, Inc., AD-37 Conversion, May 5, 1982

Naval Sea Systems Command (SEA-04F2), "Visibility and Management of Operating and Support Costs-Ship: Total Support System," FY 1980

Navy Personnel Research and Development Center, Life Cycle Navy Enlisted Billet Costs - FY 1981 NPRDC SR 81-22, July 1981

Navy Personnel Research and Development Center, Life Cycle Navy Officer Billet Costs - FY 1981, NPRDC TR 81-12, June 1981

Office of Management and Budget, Circular No. A-76 (Transmittal Memorandum No. 6), "Policies for Acquiring Commerical or Industrial Type Products and Services Needed by the Government," Jan. 26, 1982

Office of the Chief of Naval Operations, "Analysis of a Study Entitled Civilianization of Fleet Support Ships Prepared for the Joint Maritime Congress (CIV77)," Ser 96/332701, Feb. 18, 1981

LIST OF REFERENCES (Cont'd)

Office of the Chief of Naval Operations, "Guide to the Preparation of Ship Manning Documents, Volume I: Policy Statement," Ser 10470P10, Feb. 3, 1971

Office of the Chief of Naval Operations, "Investigation of Potential for Increased Use of Civilian Manning in Fleet Support Ships (CIVMAN)," Ser 96/S 590196, March 21, 1978

Office of the Chief of Naval Operations, "Manpower Authorization" (OPNAV 1000/2), Activity Code 0134-0001-00, Feb. 7, 1982

Office of the Chief of Naval Operations, "Pricing and Cost Escalation Guidance (POM 84-7)," Change 2, Feb. 2, 1982

Office of the Chief of Naval Operations (OPNAV-90P-02-D), Navy Program Factors Manual (U), Ser 901 M/587803, Nov. 18, 1980

Office of the Chief of Naval Operations (OP-96D), "Escalation Indices and Outlay Profile Factors," May 1982

Office of the Chief of Naval Operations, Instruction (OPNAVINST) 3501.12A, Oct. 29, 1980

Office of the Chief of Naval Operations, OPNAVINST 3501.15A, April 7, 1980

Office of the Chief of Naval Operations, OPNAVINST 5300.121A, Jan. 6, 1981

Office of the Chief of Naval Operations, OPNAVINST 3501.130, May 12, 1979

Office of the Chief of Naval Operations, OPNAVINST 3501.140, Jan. 23, 1981

Office of the Chief of Naval Operations, OPNAVINST 3501.153, Nov. 5, 1981

LIST OF REFERENCES (Cont'd)

Office of the Chief of Naval Operations, OPNAVINST 5320.228A, June 6, 1980

Office of the Chief of Naval Operations, OPNAVINST 5320.434, (DRAFT)

"Operation of T-1 Class Tankers," RFP No. N00038-82-R-3004, May 28, 1982

Shipbuilder's Council of America, Statistical Quarterly, First Quarter 1982

U.S. Department of Transportation, Office of Public Affairs, News, DOT 29-82, Aug. 5, 1982

U.S. Maritime Administration, letter from Mr. A. W. Friedberg to Mr. I. N. Blickstein, June 1, 1977